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The Economic Record

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THE AUSTRALIAN ECONOMY: A NEW LOOK

The Australian economy has come under severe criticism, both at home and abroad, in the past five years for a variety of reasons, not always consistent one with another. It is alleged that this is part of the Australian way of life, that achievement must always be tempered by admonitions lest the adventure of progress give way to irresponsible and uneconomic development, with its inevitable increase in prices and costs, balance of payments difficulties and impaired productivity. Even when progress has been relatively sound and vigorous, as it has been in the past four years, there is a school of thought that seeks to show that progress is at too great a rate, that the country is endeavouring to do too much too quickly, and that the pressure of demand on resources can only produce an unstable economy. The problem is not merely one of pure economic policy, but of political and social approach, and perhaps the critics and the enthusiasts alike make insufficient attempt to consider the complex of political and economic philosophy with which they inevitably approach the problem. This is true whether we are engaged in the restless task of improvising policy for an everchanging situation, or in assessing the situation from time to time as critics, with different degrees of a sense of the atmosphere in which the Australian economy has to be viewed. At least this is how the problem appears to one who has wandered about a little in recent years among the western economies and has had an opportunity of observing the progress and policy of other members of the western economy, who also have had to meet the new post-war situation in the rapidly-changing world economy as a whole. It is not inappropriate in this context to recall the biblical text: "He that is without sin among you, let him first cast a stone. . . ." This may not appear to have much relevance to our problem, but if we pause to assess briefly the world situation in which Australian post-war policy had to be devised, as well as the economic conditions in Australia, we may find it a suitable text for our enterprise.

The Post-war Situation: Challenge of Expansion

First, it is necessary to remind ourselves that of all the western allies in the war with the exception of the United Kingdom, Australia devoted the greatest proportion of resources to war and therefore had to start from further behind scratch in readjusting her economy to the conditions of peace. Secondly, at the end of the war Australia experienced one of the most severe droughts in her history, with the loss of over 20 per cent of her sheep and cattle. Thirdly, there was un-

doubtedly a confusion of ideas among the policy makers who had imbibed or propounded too freely the doctrines of what may be termed neo-Keynesianism, and who would almost certainly have been disowned by the distinguished proponent of the original Keynesian doctrine. In these circumstances, it is not surprising that the immediate post-war situation was somewhat ragged, deserving the appellation "milk-bar economy". The favourable terms of trade were the chief refuge in this time of trouble, but by 1949 a new atmosphere had developed. It was demonstrated in the immigration programme, plans for expansion on economic and strategic grounds, and a new and commendable awareness of the country's geographical situation in close proximity to South-East Asia with its rapidly expanding population, and new sense of independent destiny.

Economic policy had to be devised in a new and far more exciting background in which pure economic considerations could not be the sole determining influences in the attack on a new situation. Those who argued at the time that high immigration and development would be inflationary were fortunately not able to check the mood of expansion, and the country went forward to its period of greatest development in secondary and primary industry alike, and in extending its framework of public investment, which is essential in a modern economy if private enterprise is to make its contribution to development without causing distortion in the social structure. There was no overall plan, and many unexpected hazards had to be met on the way by a policy improvised, mostly with too long a time lag, for the particular situation. The mood of expansion has survived all the obstacles and all the critics, and there can be little doubt that it has created enduring assets, both economic and political, in the sense that Australia can claim to have responded to the challenge of development inherent in the world situation. This challenge comes partly from the impact of rapid technological change on the Western economy itself; partly from the remarkable success of the communistic economy in promoting capital formation, and the new aspirations of the under-developed economy under the spell of rampant nationalism; and partly from the rapid increase in populations, due in turn to success in the conquest of disease and the consequent lengthening of the span of life—in a word, to "death control". We have at one and the same time a shortening of the time-span of change, and a lengthening of the time-span of life, in the world as a whole. In these circumstances, it is necessary for economists to take a new look at economic policy and expansion in Australia, to consider the broader issues of strategy and international relations, to devise a positive approach to what is a new situation offering the country better opportunities than it has had since the halcyon days before World War 1.

Conflict of Expansion and Stability

There is, fortunately, evidence that this is being done. Returning to Australia, one found that a predominant matter of discussion was whether the country was developing too fast, and this was actually a

topic for consideration at a week-end conference in November last organized by the Victorian Division of The Australian Institute of Management. How much better to be discussing this than to be worrying about the problems of devastating depression as we were just 25 years before! The question was answered in the negative; despite the pressures on resources and the ever-present tendency for prices and costs to rise, it was agreed that the country was not developing too fast. There are still lingering doubts in some quarters, official and unofficial. Perhaps their most lucid expression was in the recent review of the economic situation issued by the Commonwealth Government (*1957 and beyond: An Economic Survey*). After dealing with the "boom" of 1953 to 1955, the survey says: "It thus appears that, something after four years from the time the 1953-5 boom began, the economy has again moved into balance. On the face of things we do not appear to have lost anything in prosperity through the interlude" (p. 17).

The authors of the survey have surely misread the situation if they expected that in a period of rapidly increasing population, expanding primary and secondary industry, heavy and enduring capital formation and improved techniques, the country should have lost anything in the process. It had already endured the mishandling of the great Korean War boom when the economy was getting something for nothing in the fantastic export prices of 1950-1, and squandering the proceeds in rising costs and record imports against an obviously declining level of overseas funds in 1951-2. This is the period concerning which an official inquest would be most appropriate by those who dwell too much upon the fears of inflation in a period of expansion, and are likely to impede expansion by an over-emphasis upon measures designed, as the Survey suggests, to restrain total expenditure in a phase of growth. This restraint was much more appropriate to conditions in 1950-1 and 1951-2 than in the period since then, or at present.

Recent articles in *The Economic Record* on the Australian Economy by Professors Downing, Rowan and Karmel (May and November 1956 and April 1957) contain much guidance on the basic problem that confronts the policy maker who wishes to ensure the continuance of expansion at the maximum rate, whilst preserving reasonable internal and external balance in the economy. Indeed, these articles provide the basis of a new approach to the fundamental issue confronting a semi-dependent economy like that of Australia, seeking to profit by its opportunity of expansion in developing its resources in a world that in the long term offers good prospects for the products of these resources. The issue is to ensure that policy measures will not impose obstacles in the path to progress by an excessive devotion to stability as the supreme objective of statecraft, but rather will seek to reduce the degree of instability to a minimum, whilst preserving the maximum rate of expansion consistent with the resources available at home and abroad. This is the fundamental choice that has to be made, and it is not purely a matter of economic considerations. We may choose stability

on the ground that it meets a social policy in which we are playing for security as the least disturbing state of affairs. We may choose rapid progress as the best guarantee of a wider security in the future. Both will involve economic costs. The former will inevitably sacrifice some of the material and moral benefits of expansion, its adventure and its enduring assets. The latter must mean some sacrifice of an immediate or more rapid rise in the standard of living than would otherwise take place, and some disturbance and cost to those who cannot hedge against rising prices; but the former will also involve accepting the inevitable and more elusive costs incurred by a society that places too little emphasis on the enterprise of building rapidly for the future. The articles to which I have referred fortunately imply that our choice in Australia should be in emphasizing the rate of development, and taking such measures as will at one and the same time ensure a high rate and reduce the degree of instability to a minimum. This also is the basic assumption of the article by Professor Arndt, published elsewhere in this issue. I propose now to consider the basic issues of policy involved in this assumption.

A Positive Fiscal Policy

In the first place, it involves the devotion of not less than 25 per cent of gross product to investment. This is a high rate for any of the mixed free economies of the western world, and higher than the actual rate in most Western economies. The Australian rate has been slightly above this figure in recent years. It is in excess of individual and corporate savings of any of the free economies, so that there is a fundamental problem of balancing the capital resources available with the desired rate of capital formation. There are two avenues through which this can be done, namely, the import of capital and the recourse to a fiscal policy that involves forced savings. Both avenues have been explored by Australia in recent years, as by a number of other Western economies. Unfortunately, both are considered to be doubtful expedients in certain schools of thought. Foreign borrowing involves the problems of repayment and service charges that may prove embarrassing in an economy with recurrent balance of payment problems, and a currency not fully convertible into the hard currencies of the Western world.

Fiscal policy involves maintaining a level of taxation higher than necessary for current expenditure, and this may impede enterprise and raise costs. If approached as a negative measure to check expenditure and thus curb the tendency of prices to rise, the use of fiscal policy may seem to be a disciplinary and not a constructive measure. This has been too much emphasized in recent Australian experience. It is all too frequently asserted that the rise in prices inherent in a policy of rapid expansion has dried up the main spring of saving for investment in fixed interest-bearing securities, and governments have therefore to resort to the pursuit of a fiscal policy that imposes forced savings and raises taxation to repressive levels. There is something reprehen-

sible about this, and it has been stressed too much in both official and unofficial discussion in Australia. For many years practically all the works expenditure of the Commonwealth has been met from the budget surplus, and in recent years much of the State government expenditure on works has been similarly met. In fact, over 70 per cent of investment by public authorities has been financed from taxation, and this is likely to continue if the high rate of development is sustained.

It is true that this ensures that expenditure on consumption needs is curbed, but there should be much greater emphasis on the positive aspect of the policy. It can be represented as a deliberate act of policy, designed to allocate resources for investment and development, and as such, means that the community is treading the path of prudence in a high-minded manner. After all, much of the capital for expansion in the private sector is obtained in much the same way by ploughing back profits into the enterprise in the interests of the future. This is regarded, as indeed it is, as a high-minded act of policy. Why is it not possible to look upon the finance of public investment from surplus revenue as a similar act? The taxpayer may contend that he has no benefit directly from such a policy, as does the shareholder in private enterprise. He undoubtedly has an indirect benefit, and if it is necessary to ensure his goodwill and support for the fiscal policy designed to support a high rate of public investment, it should not be beyond the wit of man to issue the taxpayer with a bond, bearing a low rate of interest and negotiable for certain purposes, for a proportion of the tax he pays. There are admittedly many practical considerations to be explored in the adoption of such a policy, and it might be necessary to review the tax structure, especially the relationship of sales and payroll taxes to direct taxation, the provision for allowances for depreciation, and the possibility of so fundamental a change as the adoption of a progressive expenditure tax. This perhaps is overdue on other grounds, and if Australia is to maintain its high rate of investment, some consideration should be given to the issue of bonds of the type I have mentioned as an integral element of fiscal policy, even if it does mean some review of the tax system as a whole. This point will be underlined when we come to consider the part that public investment must play in any developing economy.

Direct Foreign Investment

As regards foreign investment, the tendency has been in the postwar years to emphasize the part that "direct" or private investment may play in a developing economy. This has been especially the case in the Canadian economy, but in recent years it has also become the predominant form of foreign investment in the Australian economy. Professor Arndt has set out in his article elsewhere in this issue (p.) the main considerations that have to be borne in mind in assessing the balance of economic advantage to the recipient country from such investment. Since the decline of the British capital market, and the capital markets of the leading western European countries, the volume

of foreign investment for the public sector of the economy of countries like Australia is much less relatively to needs. This is sometimes attributed to the fall in the value of money, making fixed interest loans less attractive to lenders, but there is perhaps more reason to attribute it to the structure of the capital market in the United States. After all, such loans are payable in the currency of the lending country, and it is the value of that currency which should determine the attitude of the potential investor. Be that as it may, Australia and other capital-hungry countries must now accept the fact that the main form of foreign investment will be "direct" in the development of private enterprise. This is to be encouraged as an aid to expansion and to the absorption of a high rate of population growth, and as involving a net economic gain to Australia. But an important question arises as to Australian participation in the equity of the investment and in the management of the enterprises concerned. Over many years of British private investment this problem seems to have been satisfactorily solved on the whole, and this pattern might well be followed in the direct foreign investment of the future. In the long run a heavy foreign investment without adequate local participation in the developing equity and in management raises awkward problems.

Importance of Public Investment

In the pattern of investment in the modern world, public investment plays a much more vital part than is commonly conceded by the devotees of private enterprise. I dealt with this problem in 1936 at the Harvard Tercentenary Conference—("The State and the Entrepreneur", published in *Authority and the Individual*, Harvard University Press, 1937). It has become even more important since, both in the Western economy and in the other two divisions of the world economy, the Communist economy, and the under-developed economy. The problem is sketched in a paper I read to the American Philosophical Society at Philadelphia (Vol. 100, No. 5) in April 1956. The thesis developed there is that public investment in the Western economy, and still more in the under-developed economy, provides the framework in which private enterprise can develop. This is because the supply of fuel and power, of much of the transport, of irrigation, and of the necessary social investment in health and education is now the accepted responsibility of government or some public authority. Without this investment, vital services would not be available to the private entrepreneur participating in economic expansion, nor would the facilities be available for the maintenance and development of a balanced social structure in an expanding community.

In Australia public investment is about one-third of total investment, and at this level it is probably too low. Similar ratios would apply to most Western economies, but in the under-developed world the ratio is much higher. The problem we have to consider is whether the financial organization of the Western economy is such as to cope

with the maintenance of this rate of public investment, particularly in countries where neither saving nor the pursuit of an appropriate fiscal policy can supply capital of the amount required. This is why both fiscal policy and organized foreign economic aid have become so important since the war, and there is every reason to suppose that they will be more important in the future. The American economy is the most dedicated to free enterprise, and though public investment internally is greater than is generally realized, it is lower than in any other economy. But when the problem of external aid or investment arises, the greater proportion has to be provided by Congressional appropriation. Even where the aid could be regarded as a fairly sound investment, the proportion of capital for public investment sent abroad is greater from Congressional appropriation than from the capital market. So we have the paradoxical situation in which the flow of capital for public investment is to be provided in large part by either or both fiscal policy at home (forced saving) or organized foreign aid through the action of governments. It is well that this fact be recognized, and that we should no longer continue to live in a world of make-believe in this important element of our developmental plans. There is nothing reprehensible in taxing ourselves for public investment at home or abroad for what is the common good. Nor is it meriting a black mark to borrow within the limits of our capacity to service the debt.

Apart from the difficulties of borrowing, difficulties that are inherent in the structure of the lending country now as well as in the policy and phobias of a borrowing country like Australia, the simple fact is that the amount of public investment needed in the modern world is beyond our willingness or capacity to save voluntarily for this purpose. Those among us in Australia who consider that this is a phenomenon caused by the traditional recklessness of Australia are doing ill service to the cause of rapid development in the Western economy, and in the under-developed world, required to match the pace of progress in the communistic world. Thus the Economic Survey referred to above remarks, concerning the failure of savings to keep pace with investment, that "a good many of us are prepared, if we can, to go beyond what we earn and borrow what other people have saved so that we may spend that too". Even if this were the prime cause of our shortage of capital, it is a remarkable doctrine to appear in an official paper of a country or government that says it has great difficulties in borrowing on public account from abroad. The amount borrowed abroad by the Government has been trivial in recent years (in the five years to June 1956 the net figure was £91m.), representing much less than 5 per cent of total public investment. As previously indicated, the proportion financed from current taxation has been 70 per cent. No doubt we could and should save more individually, and give more attention to incentives to save, but even with the exercise of the greatest virtue in this respect, it would still be true that our savings and overseas borrowing would be quite insufficient to meet our legitimate public investment needs. Here, more than in any other aspect of economic

policy, it is long overdue that we should develop a positive approach consistent with the facts of the situation and state positively what is required, rather than dwell upon a negative approach emphasizing the need for high taxation to curb extravagance. High taxation is needed as much for the good works of development as for imposing restraints, and it will be with us for a long time if we are to keep pace with a rapidly expanding world around us. It should in fact become an article of faith, and as such a virtue.

A Chancellor of the Exchequer once said that he was concerned with what he left to the taxpayer rather than what he took from him. There is merit in this in the modern world, when what is left with the taxpayer is sufficient to enable him to live at a higher level and with greater security of employment than before, and at the same time he has the asset of a developing economy with a high stake in it through public investment. In this view the taxpayer might be getting the best of both worlds. I know this is dangerous ground to tread, but I prefer it to the philosophy that we are a wicked and faithless generation, and that there is no help in us. So in the overall picture of the Australian economy in its present moment of expansion on the grand scale, the first element in devising policy is to take a new look at the place of public investment as a frontier of development. Within a suitable framework of public investment the problems of private investment can be much more simply and easily handled. It is a mistake to accept the traditional view in the economy of private enterprise that public investment is, as it were, an accessory after the fact, and that public authorities in seeking funds for their part in promoting the expansion are interlopers in the capital market. If the economy is to develop in balance on the economic and social front, it is vital that public investment should be pursued with both vigour and confidence. This is the first element in devising economic policy in the conditions of the world today. It has the great merit that in so far as it requires recourse to a fiscal policy that imposes forced savings, it also administers an automatic check to expenditure on luxuries and so channels resources into production that supports the policy of expansion.

The Exchange Rate and the Price Level

In practice this is what the recent development of economic policy in Australia is doing. Forced as we have been to devise a policy that would maintain public investment at the minimum level required for our rate of general economic expansion, and to curb expenditure that would impose too severe a strain on resources and lead to embarrassing increases in prices and costs, we have in fact evolved the correct fiscal policy. It is not suggested that the level of public investment is as high as it ought to be. If we take a realistic view of the demands for transport, fuel and power, and health and educational facilities required for an expanding economy and a rapidly growing population with swift changes in its age distribution, it is public investment that is lagging

behind. This is an additional reason why it is desirable to approach the problem with a constructive outlook, and to explain that fiscal policy is one of the key features, perhaps the key feature, of a general economic policy designed to sustain a high rate of economic development. This, moreover, is the answer to those who speak of "the dilemma of development", in that savings are insufficient for public investment. It is better to do this than to improvise fiscal policy as a rear-guard action against the inevitable pressure that development imposes on resources. With a fixed exchange rate, the economy works within a clearly defined framework set by the volume and prices of exports on the one hand and the demand for and prices of imports on the other. This has always been the case, but in conditions of today this position has to be reconciled with the pursuit of a policy of full employment, the promotion of the welfare state, the desire to achieve the maximum degree of stability in prices, and the maintenance of a high rate of expansion. It is not possible to reconcile these conflicting objectives. A fixed exchange rate means that the prices of imports and exports will inevitably conflict with the desire to maintain a high degree of price stability. The Australian economy is highly responsive to changes in the prices of imports and exports. In fact, no other single influence has so much impact upon the internal price level. Thus if we take the year 1955-6 we find that the price level of exports compared with the average of the three pre-war years was 397, and the price level of imports was 405. On the same base, the wholesale price index was 334, the prices of food and groceries 335 and the prices of clothing at retail 397.

We might well ask whether the broad agreement among these several indices has not got its base in the originating force on the economy of changes in the prices of exports and imports. There is little that Australia can do to determine the prices of either imports or exports, except by a variable exchange rate or some measure of direct control of internal prices of exports and imports. In the absence of positive and drastic action, the changes in these prices are bound to have a decisive influence upon the internal price level. This is all the more so in a period of expansion when demand is pressing severely on internal resources. No doubt this pressure is a factor in causing prices to rise, but it is far less powerful than the prices of exports and imports. This leads to questioning the value of local measures such as fiscal policy or credit restriction as a means of promoting price stability in a situation where export and import prices are fluctuating widely, though fiscal policy can produce and maintain reasonable balance between total saving and capital formation. The rise in prices in Australia in the period 1950-3 was primarily due to the rapid rise in export and import prices; the smaller movement in the next three years was possible because there was a less violent change in these prices, and not mainly because of internal measures of fiscal policy and credit control. These were necessary to sustain the external balance at the given rate of exchange and to support the level of investment, especially public investment.

Relations with the Dollar Area

If this be the case, the question arises whether a policy of exchange stability, with a currency constantly over-valued in relation to the dollar, is not incompatible with other key objectives of economic policy, especially the desire for the greatest measure of price stability, the attraction of foreign capital, the development of long-term stability in the balance of payments and the elimination of the enervating influence of continued import restrictions. With the expansion of export production and the broadening of the base of exports, it may be possible to eliminate import restrictions within the sterling area, but there is little immediate prospect of this being achieved with regard to the dollar area unless the exchange rate is at or close to the level at which transactions with the dollar area can be brought into approximate balance. To assess the net advantage to Australia of membership of the sterling area over the post-war period would be a task of great complexity. Our key export, wool, has been sold mostly for sterling, but it has also been an indirect dollar earner for the sterling area, and the same may be said of some of our metals. How far a different policy regarding the exchange rate would have brought capital from the United States in greater quantity is another imponderable. It is also well to bear in mind that Australia and New Zealand are perhaps the only members of the Western economy that have not been in any way recipients of dollar aid in any of the programmes, not even of an "off-shore purchase".

In the long run a vigorous and independent Australian economy must establish its own independent relationship with the dollar, and it may be doubted whether the policy we have pursued both internally and externally since the war has not delayed this desired goal without imparting any greater stability to the economy. The problem is too diverse in its ramifications to be explored in this discussion, but it is one that has not been adequately considered, and in respect of exchange policy it seems to be an article of faith that the sterling-Australian rate is the key problem. This was uppermost in the minds of those who in 1949-50 propounded the doctrine of "putting value back into the pound" through the appreciation of the Australian pound in terms of sterling, whilst overlooking the fact that this would have placed Australia in still further imbalance with the dollar area. In the event, the next three years were to witness the greatest rise in prices in peace time in Australia's history. This may be regarded as a rather convincing example of the maxim that inflation is like sin—it should always be avoided, but is irresistible in practice. I dealt with this situation in an address republished in my *Inflation and Expansion* in 1951, and I see no reason to retract the argument advanced there (pp. 72-89).

Finally, we have to consider the change in the direction of the Australian export trade in the post-war world, and the prospects of expansion. The first fact to be grasped is that the proportion of our trade going to the United Kingdom has fallen from just under 50 per cent in the pre-war conditions to about one-third now. This movement seems to have been a continuous process over the post-war years, and

is one that is likely to persist. The proportion going to western Europe, New Zealand and Japan, has gone up from 20 per cent to slightly more than one-third, and this seems also to have been a continuous process. These markets are expanding for us; the market in the United Kingdom is not an expanding one for us. The fact has in part, and belatedly, been recognized in the amendments recently made to the Ottawa Agreement, in the new policy being pursued by the Department of Trade in exploring new markets, and in the recently concluded Japanese trade agreement. The two outstanding facts in this change are the economic expansion in certain countries of western Europe and the great increase in population in the Asian countries. Both are likely to continue, and both offer good prospects for an expansion of Australian trade. But they cannot be turned to our advantage without a considerable degree of enterprise on our part, and a willingness to adjust our thinking to the facts of the post-war world. In this, as in other vital elements of economic policy, our thinking must be positive and in keeping with the changes in the world economic situation. It may be doubted whether the main trends of our political thinking on our external trade prospect are any more in line with the facts, than our internal economic policy has kept pace with the rapid change in the economic structure at home or abroad. Far from being ahead of the events, we have rather found ourselves improvising policy after the events. Fortunately, this policy has been on the whole in keeping with the ultimate needs, and it is now time to state it as a constructive policy for a period of continued expansion which can be embraced with confidence. But it will be necessary to take some risks, and in particular to contemplate some rise in prices as the inevitable fate of a free economy when it is expanding rapidly. The same is true of the Western economy as a whole, despite the widespread devotion to restrictive monetary policies designed to promote price stability.

Summary and Conclusion

I have been concerned in this essay only with the general framework of policy in which the Australian economy may best meet the problem ahead of a continued high rate of development and expansion. It has been assumed that this development is soundly based in the expansion of primary and secondary industry, and in the new mineral wealth that has recently been discovered though it would be idle to ignore some blemishes in the picture. It has also been assumed that immigration will be continued at a rate of 1 per cent of population, as recently announced by the Government. A further assumption is that world population will increase rapidly and that the general tempo of world economic development will continue to be high. In these circumstances the overall economic policy most appropriate for Australia would appear to be as follows, if it is to meet the new situation it faces and to preserve the maximum degree of freedom in the economy:

1. Greater reliance on fiscal policy as a positive measure designed to bring savings and capital formation into balance, and thus to impart

to the economy as a whole a suitable distribution of resources between investment and consumption.

2. A review of the tax system to ensure that the high rate of taxes required to meet the conditions of such a fiscal policy will not discourage savings or unnecessarily raise costs of production. This would mean, in particular, reconsideration of sales taxes, depreciation allowances, and concessions for savings, and exploring the possibilities of a progressive expenditure tax.

3. Inasmuch as some of the tax proceeds would be used for investment in the public sector of the economy, some provision might reasonably be made for the issue of bonds negotiable for certain purposes for a proportion of income tax paid. This would place a reasonable cost of development on the shoulders of future generations who will be the chief beneficiaries of our present enterprise.

4. Credit policy would play a less important part than in recent years if such a fiscal policy were adopted, and there would be less need for "a credit squeeze" to ensure the proper distribution of resources between investment and consumption. The rate of interest could also be less exacting than it has been, and is likely to be on present policy. In other words, fiscal policy should take precedence over monetary policy.

5. Greater emphasis should be given to the dollar rate of exchange as the ultimate objective of exchange policy, even if this meant some depreciation of the Australian pound in terms of dollars. This would improve the ultimate prospects of dollar investment and of relieving the balance of payments problem.

6. In respect of private or direct investment, consideration should be given to some provision for local equity in the enterprises concerned, and generally more emphasis should be given to the importance of overseas investment for the public sector.

7. Finally, in respect of overseas trade, greater attention should be given to the trend of overseas markets for Australian exports in recent years, and to the likehood that these trends will be continued. In particular, Australia should seek to obtain some association with the common market in Europe and to participate in the opportunities for expansion of trade in the countries of South and East Asia, including China.

As already indicated, there are signs that Australia is evolving a policy on these lines, however great the departure may be from our traditional views and actions. So far it has been rather hesitating and apologetic, but the time has arrived when we should adopt such a course as I have outlined with courage and confidence, and say with Horace

Cras ingens iterabimus aequor.

(Tomorrow we set out once more upon the boundless sea.)

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THE LABOUR EXPERIMENT IN NEW ZEALAND

The Labour Party which came to power at the end of 1935 drew its main strength from the trade unions, but in 1935 it won the support, as the Liberal-Labour Party had done in 1890, of the small farmers. Some of its votes came also from lower-income groups both in town and country—shopkeepers, civil servants, professional people, pensioners, unemployed, office workers and farm labourers. As Lipson has remarked, many of these did not want socialism, but they had been hard hit by the deflationary policies of the coalition government and "what they did want after six years of privation was immediate security and early return to prosperity."[1]

Labour had split with the Liberals after Seddon's death in 1906. In the election of 1908 one Labour member was returned, but it was not until after the Reform government broke the bitter waterside workers' strike in 1913 that the trade unions turned seriously to politics. The United Labour Party which had been formed in 1912 drew its main strength from the older craft unions. The Federation of Labour which tested its strength in the 1913 strikes was based on industrial unionism and was Marxist, at least in theory.[2] Its organizers were militant and violent in speech, and to some extent in action. In 1913, a series of conferences united both groups—industrially in the United Federation of Labour and politically in the Social Democratic Party—but after the unsuccessful strikes of that year, the Federation was weakened and went through a series of metamorphoses. The Social Democratic Party was never strong and was soon merged with the Parliamentary Labour Party which slowly increased its representation in the House. It did not become the official opposition until 1925. The election of 1928 returned a House almost equally divided between the three parties and the Liberals took office with Labour support. When the Coalition Ministry was formed in September 1931, Labour was again the opposition. Throughout the depression, therefore, it was in the advantageous position of being able to criticize the unpopular deflationary policies of the Coalition and to offer a more optimistic programme without having the responsibility of putting it into effect until the depression was over.

Its leader until 1934 was H. E. (Harry) Holland, a left-wing journalist who had been a prominent agitator for radical causes, and had suffered political imprisonment, in Australia. Before he came to New Zealand as editor of the *Maoriland Worker* his health had been impaired by what he regarded as political persecution. A convinced Marxist, he was more widely read in the literature of socialism and

1. Leslie Lipson: *The Politics of Equality: New Zealand's Adventures in Democracy* (Chicago, 1948), p. 231. Cf. also, S. Leathem: "Policies and Trends in New Zealand", *Economic Record*, June, 1939, pp. 42-3.

2. Cf. H. E. Holland, Ross and "Ballot-Box", *The Tragic Story of the Waihi Strike* (Wellington, 1913).

revolt than the ordinary run of trade union leaders. His leadership in the party rested primarily upon his intellectual ability and forceful literary style; but he was never a popular figure in New Zealand. He lacked the sentimental humanitarianism which made his successor, Michael J. Savage, a symbol of hope to wider circles than those of organized labour. Harry Holland was much loved and loyally served by those who knew him best; but his public utterances were tinged with the bitterness of class conflict and personal suffering, and his arguments were often on a level of intellectual disputation that did not evoke emotional response. A surer political note was struck by Savage when he said:

> "I want to know why people should not have decent wages, why they should not have decent pensions in the evening of their days or when they are invalided. What is there more valuable in our Christianity than to be our brother's keepers in reality? . . . I want to see people have security. . . . I want to see humanity secure against poverty, secure in illness or old age"[3]

This was the authentic humanitarian appeal which, a generation earlier, Reeves had put into verse in his Hymn to New Zealand:

> "Not multitudes starving and striving,
> Not bondsmen of misery's dearth,
> But builders with patience contriving
> A kindlier realm upon earth,
> Where pity worn age shall environ
> Where the young start abreast in their race,
> Nor shall Fate with a gauntlet of iron
> Smite Poverty's face!"[4]

Associated with this popular leader were men who had been tempered by trade union leadership and parliamentary experience. Some of them had in earlier years been regarded as firebrands. Robert Semple, who became Minister of Public Works, had organized the Federation of Labour in the militant days of the violent strikes, but later had won a considerable reputation for efficient organization of co-operative groups of workers on public works contracts.

Peter Fraser, who became Prime Minister on Savage's death in 1940 and held that office until Labour was defeated in 1949, was at first Minister of Education. In that capacity he did much for the University of New Zealand and for education in general. A Scottish immigrant, shrewd, canny, and blessed with a wife of unusual ability, he became a great war leader and a respected figure in the councils of the Commonwealth and of the United Nations. Almost entirely self-taught, he was an avid student with considerable intellectual power, but he never lost contact with his following and quickly established himself as the ablest parliamentary tactician and the most effective politician New Zealand had produced since Seddon.

3. *Hansard*, 1938, Vol. 251, p. 649, cited in *The Growth and Development of Social Security in New Zealand* (Wellington, 1950), p. 17.
4. W. Pember Reeves: *The Passing of the Forest and Other Verse* (privately printed, London, 1925), p. 30.

Throughout the Labour Party's period of office, however, its theoretician was Walter Nash, Minister of Finance, Customs and Marketing. Also an immigrant in early adult life, a staunch churchman who had been influenced by the social philosophy which the Methodist chapels and Church leaders such as Bishop Gore and Archbishop Temple, Albert Mansbridge and R. H. Tawney had stamped on the labour movement in Britain, Nash was not only a social reformer but an able organizer.

A case might be made for the thesis that the British Labour Party had been weaned from the individualistic liberalism of Calvinist tradition to the English Catholic doctrine of social solidarity by the influence of this group of churchmen, exerted largely through the tutorial classes and conferences of the Workers' Educational Association.[5] Philip Snowden, almost the last of the labour leaders to be nurtured on the Calvinist doctrine of nonconformity, died defending those pillars of the liberal faith—free trade and the gold standard. But a generation of younger leaders, studying and arguing in organized discussion groups under university tutors, gradually developed the theories of a welfare state. At one time there were two hundred tutorial classes usually on a three-year basis, limited to thirty members, and engaged in serious reading, essay-writing and class discussion. The influence of the workers upon the tutors and through them upon the universities was a powerful as the influence of the universities upon the trade unions. Among the early tutors were, for example, Clement Attlee and Arthur Greenwood. A typical, and traditional, British philosophy of action emerged, eschewing both the pseudo-science and class conflict of Karl Marx and the essentially aristocratic faith in expert bureaucracy of Sydney and Beatrice Webb. Hooker's *Ecclesiastical Polity,* rather than *Das Kapital* or the *Fabian Tracts* was the ultimate source of the welfare state.

Walter Nash brought these ideas to New Zealand and left his mark upon the programme of the Labour Party. He was on the National Executive from 1919, National Secretary from 1922 to 1932, and President in 1935. His organizing ability during the depression was largely responsible for its success at the polls in 1935. Not least effective was his 1935 election pamphlet, "Guaranteed Prices, Why and How", the preamble to which promised that "the Labour Party undertakes

5. Cf. F. A. Iremonger: *William Temple, Archbishop of Canterbury, His Life and Letters* (London, 1948), Ch. V and *passim;* T. W. Price: *The Story of the W.E.A.* (London, 1924); A. Mansbridge: *The Trodden Road* (London, 1940); Mary Stocks: *The Workers' Educational Association* (London, 1953): H. P. Smith: *Labour and Learning* (Oxford, 1956); and R. H. Tawney: *Religion and the Rise of Capitalism* (London, 1926), especially the reference to Hooker (p. 170).

Many of the leading trade unionists in New Zealand, several of whom became members of the first Labour Cabinet, including H. E. Holland, Fraser, Nash, Semple, Armstrong, were members of the first W.E.A. classes while E. J. Howard, who became Speaker of the House, was one of the Joint Secretaries of the Tutorial Class Committee in Canterbury from its inception, the other being the Rev. L. G. Whitehead.

For a brief biography of Walter Nash, see Introduction, by Eric Estorick, to Walter Nash: *New Zealand: A Working Democracy* (New York, 1943).

to institute the guarantee procedure, and to pay the agreed-upon price for all butter, cheese, wool and meat during the first year after it becomes the Government".

There were other colourful figures in the first Labour Cabinet—D. G. Sullivan, a journalist who made his political career by supporting the protectionist movement and became Minister of Industries; H. T. Armstrong, a trade union secretary who was a master of trade union law and parliamentary procedure and became Minister of Labour; and P. C. Webb, representative of the militant coal miners on the west coast of the south island who was made Minister of Mines. It was indeed the strongest cabinet New Zealand had seen for many years, and it had a clear-cut programme. Many of the ministers had had a stormy career as agitators, but the policy that began to emerge from cabinet and caucus discussions was not one to alarm the country. Indeed there was much grumbling by a left-wing minority which failed either to secure cabinet posts or to achieve any great influence on legislation. This minority was led by John A. Lee, a wounded veteran who had published the first of a bitter series of novels, characterized in his opening dedication as "this story of the gutter".[6]

Lee had been appointed Parliamentary Under-Secretary of Finance, with responsibility for the housing programme, but soon clashed with Nash who was Minister of Finance. He lost his position and, after expulsion from the party, his seat in the House. The Labour Party had established the practice of associating all its parliamentary members with definite portfolios and pooling salaries of ministers and members. The caucus of the party gained power and when Peter Fraser became Prime Minister on the death of Savage in 1940 he allowed it to choose his cabinet and allot their portfolios. In this way the left-wing obtained Ministerial representation at first through D. G. Macmillan and, on his resignation in 1941, through A. H. Nordmeyer. Though Nordmeyer became one of the leading figures in the Cabinet, its policy was not greatly changed.

The programme developed in opposition was largely enacted in the first parliamentary session of 1936-8. There had been a marked recovery from depression conditions and Labour won the election at the end of 1938 with an enhanced majority. Soon thereafter war broke out in Europe, and New Zealand immediately declared war on Germany. Thereafter the activity of the Labour government was largely devoted to the war effort. Though many of the cabinet had opposed the first world war, they were united in vigorous conduct of the second war and firm in administering conscription. By legislation the life of Parliament was extended until 1943 when Labour was again returned to power though with a reduced majority.

The election results in 1943 revealed that small farmers had turned against the government and in consequence Labour in 1945 used its parliamentary majority to abolish the "country quota". By this time

6. John A. Lee, *Children of the Poor* (London, 1934); *The Hunted* (London, 1936); and *Civilian into Soldier*, London, 1937.

the anti-depression legislation, including social security, was firmly on the statute books. The dairy farmers were dissatisfied with the working of the guaranteed price system and there was considerable alarm about the inflationary trends in the economy and the growing burden of regulations and restrictions. What was left of the Labour programme was a combination of planned industrialization and stabilization of domestic prices. The election of 1946 was bitterly fought. Ninety-five per cent of the European population cast a vote that was divided almost evenly between Labour and their opponents of the National Party with equal representation in the House. Labour won the towns, but the National Party won the country seats. But the four Maori constituencies elected Labour members and provided a slim majority, after the election of a Speaker, of three in a House of 80 members. For the remainder of its term of office, therefore, Labour governed with a precarious majority, but persisted in its programme of stabilization and regulation. Its mandate, however, was exhausted and in the election of 1949 the National Party won a substantial victory. The period of experiment was over.

There are, therefore, three phases in the Labour Party's fourteen-year period of rule. During the first four years from December 1935 till war broke out in September 1939, most interest attaches to the measures taken to restore normal economic activity after the great depression, and in so doing to remedy the harsh inequities of income distribution consequent upon the severe deflationary policies of the Coalition government. At the same time the community defences against sickness, poverty and unemployment were restored and greatly extended.

From September 1939 till the election of 1946, New Zealand was virtually in a state of siege. The Pacific War came closer home than the first world war; but New Zealand's main effort was in the Middle Eastern, Mediterranean and western European theatres. The Labour government's whole-hearted conduct of hostilities was facilitated by the measures of control already taken over the major segments of economic activity. A strong central government exercising regulative and administrative controls over credit, the balance of payments, prices and wages, is easily able to adapt those controls to the necessities of a war economy. The New Zealand war effort was remarkedly effective and by reason of firm controls much of the dislocation of values that occurred in the first world war and post-war years was avoided. Throughout the war period the government could count upon the support of its political opponents, and after 1942 upon the left-wing trade unions also, in its vigorous prosecution of the war.

The brief period after the war when Labour attempted to implement its programme of planned development behind the insulation of exchange control was the crucial test of its economic and monetary philosophy. It is true that the post-war developments were implicit in its programme, that they built upon legislative and administrative measures taken in earlier years, and that few radical changes were

made after 1946. It had not been necessary to impose exchange control and import selection till the end of 1938; but these were always contemplated. They would have been necessary during the war in any event. It was not till the first pre-war years of reflation and the war years of mobilization had passed, that the issues of distributive conflict and economic power, as well as the inflationary pressures in the economy, were clearly revealed. By this time Labour had lost the support of the small farmers on the right and faced increasingly militant pressures from the public service associations as well as from strongly-organized industrial unions on the left. There was some evidence of communist or party-line leadership in the civil service as well as the unions. In the condition of over-full employment that had been achieved, stabilization threatened to degenerate into a spiralling inflation. There were other factors involved. The lower-income groups that had supported Labour in 1935 and 1938 became disillusioned with high taxation, irksome regulations, shortages and inferior qualities of consumers' goods. The leaders of Labour had carried a heavy burden for many years and little new blood had come into the party.

Appraisal of these fourteen years is complicated not only by the three phases through which the economy passed; but by the nature of the controls that were introduced. Primarily what was attempted was control rather than state enterprise. Some new state enterprises were set up, but these were minor. There was some nationalization of existing enterprises and institutions, notably the Reserve Bank and the Bank of New Zealand, broadcasting, domestic airways, and a rather considerable venture into state housing; but the main stream of production was controlled rather than directed into new channels of state enterprise. All the ventures in nationalization followed precedents already set in New Zealand. Indeed they could be paralleled in many countries. The control of the economy was exercised by detailed Ministerial decision in particular cases rather than by the application of broad general principles. The marketing of exports had been socialized before Labour came into power and, as Miller has pointed out, the Coalition government during the depression had "employed the authority of the State almost as if the country was a single firm and the Cabinet a board of directors".[7] What was changed after Labour came into power was the extent of control and its concentration in the hands of Ministers. Nationalization, even of the Reserve Bank, was incidental to this assumption of ministerial authority in detail as well as in general.

The philosophy of the Labour programme was in essence simple. It was to insulate the national economy from external fluctuations in the export markets, and upon the basis of a stabilized national income to achieve simultaneously three major objectives—stability of domestic prices, social security and income redistribution, and national development. The main instrument of policy was control of the credit system. There was much talk of planning, but in fact there was no plan. It was

7. Harold Miller: *New Zealand* (London, 1950), p. 119.

not until November 1945 that a planning division was created in the Ministry of Works that in March 1943 had taken over the functions of the Defense Construction Council as well as the Public Works Department and the Housing Branch of the State Advances Corporation.[8] The Organization for National Development that had been created in 1943 was absorbed into the Ministry of Works in 1945; but no detailed overall plan of development was ever established. Even in the crucial matter of exchange control, there was evidence of improvisation in the financial crisis of 1938, and a free exchange market continued to exist side by side with export control and import selection. Not until the regulations of July 18, 1940, closed the various gaps in the system did this free market become illegal. Only then could it be claimed that "the framework of exchange control in New Zealand is now complete . . . no type of overseas payment, whether inward or outward, remains outside the scope of the system."[9]

Little reliance was placed upon taxation as a means of income redistribution. There was no "soak the rich" policy. There were so few large incomes in New Zealand that little was to be gained from attempting to redistribute them through a penal system of graduated taxation. The Labour Party in 1936 reimposed the graduated land tax and made it concurrent with the graduated income tax; but there were few large landholdings left and the main incidence was on urban commercial property. Receipts were small and stable in a constantly expanding budget, consistently running about half a million pounds more than receipts from the flat rate of land tax that had been in force before 1936. The rates of individual income tax were somewhat increased and subjected to various surcharges during the war; but this was not regarded either as the main source of funds for government expenditure, or as the main instrument of income redistribution.[10] Indeed the income tax paid by companies (about 60 per cent of the total income tax) was largely passed on to consumers in higher prices, at least during the period of economic stabilization after 1942. Since dividends on which tax was thus collected at the source were deductible from individual incomes (except in respect of the tax bracket in which the remaining income was assessed) this part of the tax was indirect rather than direct and the progressiveness of the tax system was thereby mitigated.[11] When the war began, the government imposed a National Security tax which rose from 5 to 7½ per cent. The increasing cost of

8. C. G. F. Simkin: "Economic Planning and the New Zealand Ministry of Works," *Economic Record,* June, 1947.

9. A. R. Low: "Exchange Control in New Zealand", *Economic Record,* December, 1940.

10. Cf. *New Zealand Official Yearbooks* 1938, p. 556, and 1954, p. 109. The significant figures were:

	1935	1936	1939	1949
Land Tax £N.Z.m.	0.5	0.5	1.0	0.9
Income Tax £N.Z.m.	3.8	4.6	6.6	49.0
Total Taxes £N.Z.m.	24.7	25.5	31.2	130.4

11. W. Rosenberg: "A Note on the Incidence of Company Tax under the regime of Price Control in New Zealand", *Economic Record,* December, 1951.

social security and income redistribution, and national development ment on all incomes. Public works, in the New Zealand tradition, were financed out of loans. The Sales Tax introduced in 1933 at 5 per cent, was not abolished but increased in June 1940 and May 1942 by a further 5 per cent and 10 per cent respectively. The economists reporting in the *Economic Record* on successive budgets constantly emphasized the regressive nature of the direct taxation levied by the Labour government. Moreover, for the last three years of Labour's tenure of office, 1946-9, virtually no changes were made in the tax system.

The main reliance was in fact placed upon manipulation of the credit system to achieve the objectives of domestic price stability, social security and income redistribution, and national development and to achieve them in a stabilized economy. The controls (which extended over many aspects of the economy and functioned through elaborate machinery but were in fact operated by ministerial discretion exercised in considerable detail) were designed mainly to co-ordinate and stabilize the relationships of the various segments of economic activity. Social security benefits were financed by contributions that constantly needed supplementing from the consolidated fund, income redistribution was dependent upon public expenditures that constantly increased, and national development was designed not only in the familiar form of public works but as the promotion of secondary industries to provide employment.

Labour took office at a time of considerable under-employment of resources. There were more than 57,000 unemployed workers on the register. There were factories idle or on short-time. Credit was abundant and cheap. There was an accumulation of funds in London to be drawn upon. In such circumstances the Minister of Finance could be open-hearted and open-handed. When war broke out in September 1939, the number of registered unemployed had been greatly reduced. It was not long before there was an acute shortage of manpower and an even more acute shortage of womanpower. At war's end, unemployment had become a depression memory and inflationary scarcity of manpower, as well as of goods, had become the major problem. Vacancies far exceeded the number of applicants for jobs, as they continued to do long after the Labour Party lost power in 1949.

Still belief persisted in the magic of credit to achieve all economic objectives. Early in 1944, Frank Langstone, the leading exponent in the party of ideas closely akin to those of the Douglas Credit movement, carried a motion at the annual Labour Party Conference calling for nationalization of the Bank of New Zealand. Nash, who had steadily opposed this step as unnecessary in view of the government's ownership of the Reserve Bank, found it expedient to bow to the will of the majority and second the motion, which was duly implemented in November 1945. In his speech to the conference, Langstone is reported as urging on his reluctant colleague: "Archimedes said, 'Give me a long enough lever and I will lift the world'. Here's the lever, Mr. Nash.

It will make it possible for the sunshine of economic prosperity to shine in even the darkest places.''[12] This pathetic and muddled belief in the power of credit to cure all economic ills is perennial in New Zealand, as in many other countries. It was a factor in the Labour Party's sweeping victory of 1935, despite the inept appearance of Major Douglas himself before the Monetary Committee of 1934, when he produced as a depression remedy only the suggestion that bank reserves should be credited to the holders of overdrafts at the banks.[13] It was potent throughout the Labour Party's tenure of office and never more potent than in the post-war years when it was least applicable.

Despite this pressure, the government refrained from credit creation except in minor degree. With a comfortable external balance it had no need to resort to the Reserve Bank in 1936-7. When export prices fell and it had to impose exchange control at the end of 1938, it did borrow from the Bank and seemed to be facing the dilemma of inflation or cutting its programme. The war rescued it by making it possible both to impose heavy taxation and to abandon all construction except for war purposes. It financed the war effort by taxation and local borrowing and did not use its power over the Reserve Bank to avoid imposing the necessary heavy sacrifices. At the close of the war it had paid off overseas debt and had built large London balances. But in the crisis of 1949, export prices dropped. The fall in export receipts was slight, but to maintain the momentum of the government's domestic policies it was necessary to resort to inflationary advances from the Reserve Bank. Thus it was evident that, unless it could count upon rising export prices, the programme of development must either be checked or must lead to inflation. There were many factors in Labour's defeat in 1949; but fear of inflation was one of the most potent.

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12. Cited by C. G. F. Simkin, "The Nationalization of the Bank of New Zealand", *Economic Record*, December, 1951.

13. Cf. *Report of the Monetary Committee and Minutes of Evidence*, Wellington, 1934, reviewed by A. G. B. Fisher, *Economic Record*, December, 1934, and J. M. Keynes, *Economic Journal*, March, 1935.

TRENDS IN PRODUCTION AND LABOUR PRODUCTIVITY IN AUSTRALIAN MANFACTURING INDUSTRIES*

1. *Introduction*

The purpose of this article is to attempt an assessment of the long-term changes that have taken place in total output and in output per head in Australian manufacturing industry. With the growth in Australia's industrial sector in relation to the rest of the economy, changes in output per head in manufacturing necessarily become progressively more important in influencing both the standard of life and the balance of payments. The present article is confined purely to a discussion of the secular trends in output and in output per head so far as they can be estimated; it does not attempt to explore the implications of such trends for the internal economy or for the balance of payments.

By the term "labour productivity" is meant physical output per head per year or physical output per man-hour. Further, we are not here concerned with the absolute level of productivity, but only with relative changes through time. For our limited purposes, therefore, we can take changes in output per head per year as being measured by the ratio of an index of the volume of production to a corresponding index of employment. Similarly, output per employee-hour is taken as the index of output per employee-year divided by an index of hours worked.[1]

The immediate difficulty with which we are confronted is the absence of any continuous index numbers of production for Australian manufacturing industry. This is not perhaps surprising in view of the statistical difficulties involved in constructing such index numbers over a period of rapid industrial growth and diversification, and of the logical difficulties involved in interpreting the results. There is, indeed, much to be said for the school of thought which insists on the essential ambiguity of the index number technique in periods of rapid change. It is another matter, however, to decry *any* attempt at summary measurements by the use of index numbers. For many practical purposes, it is sufficient to know approximate changes and broad movements. As with other index numbers, the appropriate use of a pro-

* The author is greatly indebted to S. P. Stevens, W. M. Corden and H. P. Brown for their constructive criticisms of an earlier draft of this article, and to D. A. Rowe for his assistance on the Statistical Annex. Needless to say, any errors of fact or judgment which remain are the author's alone. This article is an offshoot of the research on industrial growth and international trade being undertaken at the National Institute of Economic and Social Research, London. This work has been made possible by the generosity of the Leverhulme Foundation.

1. These ratios indicate changes in total physical product per man (or per man-hour). They make no allowance for the effects of structural shifts as between different commodities. Changes in the productivity of labour in the narrower sense, allowing for structural changes of this sort, would need alternative index numbers of industrial production, using man-hour weights. See *Index numbers of industrial production,* U.N. Statistical Office (1950).

duction index depends on the margin of error involved in relation to the specific comparison which is being made.

In the present case, the objective was to make comparisons of output and of output per head over the past 40 years or so, and it seemed reasonable to suppose *a priori* that it might well be possible to construct production indices containing a margin of error which was small in relation to the considerable changes that have occurred in Australian industry over this period of time. The method used was to "deflate" the recorded (gross) values of output for each industry group by specially constructed indices of changes in unit values. The unit value indices were based on quantities and values of individual commodities produced, as recorded in the relevant *Production Bulletins;* where such indices could not be constructed for lack of data, indices based on relevant wholesale price and/or wage rate data were used. The details and the rationale of the method are further discussed in the Statistical Annex. While the computation of volume index numbers by price deflation has some advantages over other methods if sampling techniques are used[2], there are some important qualifications which must be borne in mind when interpreting the results.

The first qualification is that the index numbers relate to output on a gross, and not a net, basis. This is an inevitable corollary of the use of unit values which are themselves on a gross (i.e. selling value) basis. Insufficient information about materials purchased is available in the *Production Bulletins* to allow the calculation to be extended to an index of the volume of net output.[3]

There may be some divergence between the trend of production on a gross basis, on the one hand, and the trend in the volume of "work done", as represented by changes in net output at constant prices. This would occur if input prices moved differently from output prices, or if the physical relation between input and output changed over time. No systematic information is available about relative input and output prices but, as regards the second factor, it may be noted that the net value of industrial production remained at 40 per cent of the gross value of output for all the periods covered by the present calculations. While there may well be some bias in the results, therefore, it is not possible to estimate its extent or its direction.

Second, the volume series presented here inevitably make no allowance for changes in quantum not reflected in the recorded figures of output. A good example is in the engineering field; if there is a trend over time towards the production of lighter machines, there will be a downward bias in a volume index based on recorded figures of the weight of machinery produced. Such a bias is not very likely to exist in other sectors, such as textiles, where there has probably been no definite trend one way or the other in this respect. The difficulty is

2. See discussion in the Statistical Annex.

3. It would have been possible to combine "gross" index numbers for individual trades into industrial group totals by using net values of production in each trade as weights; in some ways, this would have been preferable to the use of gross values, but the resultant "hybrid" index might have been more difficult to interpret.

not, of course, confined to volume series based on "deflating" value figures; it is a general problem which can be overcome only by developing quantity units which are more related to capacity (e.g. horse-power of certain types of machines would be more relevant here than their weight). This whole problem is not the same as that arising from quality changes; the latter are taken into account by the deflation method in so far as quality changes affect the selling value, and the deflator is a genuine price index relating to goods of constant quality.[4]

Third, there may be some downward bias in the volume index numbers as a result of the rapid diversification of Australian production during the Second World War, and any comparisons of the volume of production between the war period and either pre-war or now would, to some extent at least, be disturbed by the very different price changes for the new items (many of which would not be shown separately in the published statistics) than for the well-established ones.

This difficulty is, however, very considerably reduced if we take a direct comparison of pre-war with the late 'forties, when the variety of new items introduced during the war and the immediate post-war years can reasonably be assumed to be subject to much the same cost conditions of production as the more established lines.

If this is so, then the most reasonable assumption one can make about the hypothetical price changes of such commodities between pre-war (when they were not produced) and the late 'forties is that they are similar to those of closely comparable commodities produced by the same industry in both periods. Nevertheless, it would probably be unwise to assume that all such newer lines of production were, in fact, operating under normal cost conditions even by the late 'forties; to the extent that they were not, there would be a corresponding downward bias in the volume series. The point probably relates most to the series for the metals and engineering industry where the introduction of new lines—as distinct from the expansion in output of existing lines—has been of considerable importance.

Finally, there is the sampling error resulting from the use of the limited information about quantities and values of individual commodities as published in the *Production Bulletins*. For those series based on this method of deflation, the standard error of each index has been computed and these are shown throughout the following tables. The details of the calculation are discussed in the Statistical Annex. These margins of error should not be taken as necessarily precise; they do no more than indicate the possible order of magnitude of error, based on the assumption that the commodities selected for the calculation are representative of the entire range of output. Errors in the index numbers may also arise from other causes, particularly if the selected com-

4. This ideal is not reached in the present calculation, which uses unit value deflators. However, it is reasonable to expect that some part, at least, of the quality factor is taken into account in this way. Quality changes are normally not taken into account in volume series which are based on movements in physical quantities produced.

modities are not fully representative as regards price movements, so that the margins of error given here should be taken as minima. For those series based on assumed unit values derived from the movement in relevant wholesale price and/or wage rate series, no standard error can be estimated; since these series relate to extra-censal data, the margin of error in the resulting volume series can be assumed to be greater than for the series based on census unit values. The movements in the various unit value and price series concerned are shown in Appendix II.

2. *Secular Trends in Industrial Production*

Since we are concerned here solely with the long-term trends, it was decided to compute index numbers for selected periods only, so as to reduce the amount of computations involved. The periods chosen were averages[5] of the following groups of years:

1911—1913
1927-8—1929-30
1936-7—1938-9
1947-8—1949-50

This series of years was chosen so as to avoid years of serious unemployment in the inter-war period. However, any choice of years in the 1920's and 1930's is likely to be somewhat defective in this respect, though it is thought that the groups of years finally selected would fit in with the longer-term trends in Australia reasonably well. This is perhaps less true for the trend in productivity than for that in total production. Average unemployment in the four periods, as measured by the percentage of Trade Union members unemployed, was 5·2 in 1911-3, 11·7 and 9·6 in the two inter-war periods, and 1·0 in the fourth period.

To bring the series more up to date, index numbers for a further period, viz. 1953-4—1953-5, have been computed on the basis of indices published by Dr. S. P. Stevens and by the Australia and New Zealand Bank.[6]

Over the entire period of some 40 years covered, it is thought that the index numbers should provide a reasonable approximation to the secular trend in the volume of manufacturing output in Australia. Naturally, the indices given here would be inappropriate for a study of cyclical fluctuations.

Table I shows the indices of manufacturing output derived from the calculations, using the period 1947-8—1949-50 as the comparison base. The indices for periods prior to the base are, however, not strictly comparable with those for 1953-4—1954-5, since the former are on a "gross" basis, while the latter are on a "net" basis. Nevertheless, it is unlikely that this difference would seriously distort the broad com-

5. Averages were chosen since the present calculation formed part of a larger investigation into the relation between the growth of Australian industrial production and imports of manufactured goods, and averaging provides more valid comparisons between production and imports than would the figures for single years.
6. See Bibliography.

parisons with which we are here concerned. It would, however, be unwise to place too much reliance on small differences between the indices for the period before and after the base.

TABLE I

Volume Indices of Manufacturing Production

(1947-8—1949-50 = 100)

Industry Group	1911–13	1927/8-1929/30	1936/7-1938/9	1947/8-1949/50	1953/4-1954/5
	Gross output basis			—	Net output basis
1. Food, Drink and Tobacco..	33±1	54±3	71±3	100	120
2. Textiles, Leather and Clothing	29±3	45±5	70±6	100	116
3. Chemicals and allied trades	21	33	48	100	141
4. Metals and Engineering ..	23	35	58±6	100	164
5. Building Materials ..	44	60±9	65±5	100	129
6. Paper, Printing, etc. ..	30	45	59	100	(150)a
7. Energy	6—8	30	54	100	195—215
8. Miscellaneous factory trades	30	57	72±14	100	..(b)
Total	27	45	64±3	100	141—142
Total, excluding Energy ..	29	46	64±3	100	139

(a) Approximate index, based on deflation of output figures.
(b) No general index available.

Total manufacturing production in Australia expanded very substantially over the period covered by Table I. Production in 1953-4—1954-5 was more than double the immediate pre-war average, and over five times as great as prior to the First World War. Compared with the late 'thirties, the biggest expansion by 1953-4—1954-5 had been in the energy sector, with chemicals and the metals and engineering industries close runners-up. The smallest expansions (about two-thirds) were in the production of textiles, leather and clothing, and in the processing of food, drink and tobacco.

Table I is, however, difficult to interpret in so far as the periods shown are separated by a varying number of years. This difficulty is met by Table II, which shows the average annual rate of increase from one period to the next.

A notable feature of the industrial expansion between 1911-13 and the late 'twenties was the more or less even progress made by all the main industry groups. The exceptions were building materials, with a relatively small rate of growth, and energy and miscellaneous manufactures with a relatively high rate. The rapid expansion in electricity generation was a notable feature of this period.

Between the late 'twenties and the late 'thirties the average rate of growth in manufacturing output was increased. A sharp expansion took place both in textile production and in the output of metals and engineering goods, which was undoubtedly closely connected with the

depreciation of the Australian currency in the early 1930's and with the measures taken by the Australian Government to protect and develop import-saving manufacture at home. Energy production continued to expand at a faster rate than any other industry—a sure sign of a rapidly developing economy.

TABLE II

Annual Average Compound Rates of Increase in Industrial Production

Per cent

Industry Group	1911–13 to 1927/8–29/30	1927/8–29/30 to 1936/7–38/9	1936/7–38/9 to 1947/8–49/50	1947/8–49/50 to 1953/4–54/5
(Years)	(16¼)	(9)	(11)	(5¼)
1. Food, Drink and Tobacco ..	3·0	3·1	3·2	3·4
2. Textiles, Leather and Clothing	2·7	5·0	3·3	2·7
3. Chemicals and allied trades ..	2·8	4·3	6·9	6·4
4. Metals and Engineering ..	2·6	5·8	5·1	9·4
5. Building Materials	1·9	0·9	4·0	4·7
6. Paper, Printing, etc.	2·5	3·1	4·9	(7·7)
7. Energy	8·3–10·2	6·8	5·8	12·9–14·9
8. Miscellaneous factory trades	4·0	2·6	3·0	..
Total	3·1	4·0	4·1	6·4–6·6
Total, excluding Energy ..	2·8	3·7	4·1	6·2

Over the decade from the late 'thirties to the late 'forties, the pace of growth appears to have increased slightly, compared with that in the preceding decade, notwithstanding the difficulties of the war and its immediate aftermath. There was a further substantial growth in metals and engineering production and in the production of chemicals, stimulated in the first instance by the needs of a wartime economy cut off to an important extent from its normal sources of supply. Though the rate of growth in energy production exceeded the average, it did not maintain the relationship in growth-rates of the previous periods. In fact, power shortages were a continual difficulty in the Australian economy in the 'forties.

A sharp increase in the annual rate of growth is shown from the late 'forties to 1953-4—1954-5. Energy production expanded at rather more than double the rate in the rest of the manufacturing sector (power shortages had been fully coped with by the mid-1950's), while metals and engineering also advanced at a relatively fast pace. Once again, the food and textiles industries lagged behind, even though in 1953-4 there was a rebound from the recession of the previous year.

As a result of these diverse movements, there have been some notable changes in the relative importance of the different industry groups. In particular, the metals and engineering industries, which had accounted for one-quarter of total net value of production in 1911-12, and in the late 'twenties, produced nearly one-third of the total just prior to the last war, and more than two-fifths by 1953-4—1954-5.

3. *Secular Trends in Industrial Labour Productivity*

Output Per Person Employed

The growth of production has been generally accompanied by a rise in physical output per person employed in the different industry groups. Table III shows these changes for each group, together with the corresponding changes in numbers employed. Taking the period

TABLE III

Trends in Employment (E) and Output per Employee-Year (OPE)

Industry Group	Series	1911–13	1927/28–1929/30	1936/7–1938/9	1947/8–1949/50	1953/4–1954/5
1. Food, Drink and Tobacco	E	43	59	69	100	105
	OPE	77±2	92±5	103±4	100	114
2. Textiles, Leather and Clothing	E	46	59	71	100	100
	OPE	63±7	76±7	99±8	100	116
3. Chemicals	E	23	38	57	100	117
	OPE	91	86	84	100	121
4. Metals and Engineering	E	25	38	52	100	123
	OPE	92	92	112±12	100	133
5. Building Materials ..	E	60	58	64	100	126
	OPE	73	103±15	102±8	100	102
6. Paper, Printing, etc. ..	E	50	67	77	100	115
	OPE	60	67	77	100	(130)
7. Energy	E	46	68	66	100	124
	OPE	13–17	44	82	100	157–173
8. Miscellaneous factory trades	E	28	50	61	100	109
	OPE	107	114	118±23	100	..
Total..	E	37	50	62	100	114
	OPE	73	90	103±5	100	124–125
Total, excluding Energy ..	E	37	50	62	100	114
	OPE	78	92	103±5	100	122

of 40 years as a whole, it seems legitimate to conclude that the greater part of the expansion in industrial output can be attributed to the increase in the labour force; only a relatively small part is attributable to the increase in output per employee-year. The period from the late 'forties to the early 'fifties has, however, proved exceptional in so far as output per head has expanded at a faster rate than the labour force in all industrial groups except building materials.

The relation between the growth in output per head and in employment from one period to the next is summarized below for total manufacturing industry:

Change from		Employment		Output per employee	
1911-13	to 1927-8—1929-30	+ 35%	+ 68%	+ 23%	+ 41%
1927-8—1929-30	to 1936-7—1938-9	+ 24%		+ 15%	
1936-7—1938-9	to 1947-8—1949-50	+ 61%	+ 84%	— 3%	+ 21%
1947-8—1949-50	to 1953-4—1954-5	+ 14%		+ 25%	

In the period up to the Second World War, only about one-third of the total growth in manufacturing output can be attributed to the increase in physical output per employee; about two-thirds was due to the expansion in the labour force. This type of industrial expansion, which is relatively labour-intensive, was characteristic of most Australian industry in this period (the provision of energy is a noteworthy exception).

Comparing the position in 1953-4—1954-5 with that just prior to the Second World War, it is evident that the growth in total output in this period also resulted largely from an expansion in the labour force; this appears to be particularly true in the metals and engineering industries and in chemicals, as well as, in lesser degree, in the other industrial groups. The figures suggest that output per head may have been abnormally depressed in the late 'forties, so that the sharp rise between that period and the early 'fifties contains an element of "short-term" recovery as well as one of secular growth.[7] This point is further examined below.

There are several features of interest revealed by the *per capita* production figures themselves. Among these, perhaps the following three in particular call for comment here. First, the considerable variety of experience from industry to industry is noteworthy; one cannot generalize easily or relate the movements uniquely to a particular factor, such as the rate of growth in output. Second, the general rise in output per head from 1911-13 onwards was interrupted after the late 'thirties. This interruption came during the Second World War when Australian industry was set the task of expanding output in the face of contracting supplies of materials from abroad and with a depleted labour force. By the late 'forties, Table III shows that output per head had virtually regained the pre-war level; thereafter, the upward trend appears to have been resumed. Thirdly, the rate of growth in output per head over the entire period appears to be rather on the low side.

As regards the variety of experience between industries, easily the sharpest increase in output per head over the period since 1911-13 has been in the provision of energy. In the period up to the second war, there were substantial increases in output per head in the textile and allied trades; in food, drink and tobacco and, to a lesser extent, in paper, etc. The index numbers for chemicals probably have too high a margin of error for any definite conclusion to be drawn for this group. After the war, *per capita* production rose most in energy, chemi-

7. It seems likely that the relatively low figure for output per head in the late 'forties was due, at least in part, to the effects of the 1949 coal strike.

cals and (probably) paper, compared with the late 'thirties. In the other industrial groups, only small increases were generally achieved.

The interruption of the upward secular trend in output per head during the war would appear, from the figures in Table III, to have been particularly noticeable in metals and engineering and in the miscellaneous industries. Annual output per head was almost certainly adversely affected during the war years, and in the late 1940's, by shortages of raw materials which resulted in uneconomical use of labour. Moreover, the power shortages (which continued up to about 1951-2) also adversely affected annual output per employed person, while the 1949 coal strike was an aggravating factor. It may be, also, that these "real" depressing factors are reinforced by the "statistical" downward bias in the index numbers. which was mentioned earlier. If so, annual output per head in the metals and engineering industries in the period 1947-8—1949-50 may have been no lower than in the late 'thirties; even so, it seems most unlikely that it could have been significantly higher. It is also unlikely that the bias can be very substantial in the index for total manufacturing production, so that the conclusion reached earlier, that the interruption of the upward secular trend in output per head caused by the war had just about been made good by the late 'forties, seems to be a valid one.

Finally, the low rate of growth in output per head needs closer examination. For Australian industry as a whole, the average rate of growth was about 1½ per cent *per annum* cumulative from 1911-13 to to the late 'thirties; from then to the early 'fifties, the rate of growth fell to 1¼ per cent *per annum* cumulative. It seems likely that the higher rate of growth in the final period (late 'forties to early 'fifties) includes an element of recovery from the abnormal conditions of the 1940's.

Output per Employee-Hour

Another important factor influencing the trend in annual output per head has been the general decline in hours worked. No figures are published on *actual* hours worked in Australian industry, the official statistics relating to *standard* hours, not allowing for overtime or short-time. The relation between actual and standard hours can be expected to vary significantly between years of good and bad trade. As mentioned earlier, the periods used in the present analysis were chosen so as to avoid years of serious unemployment, but even so it seems likely that the standard hours figures overstate the reduction in hours of work that has actually occurred since the late 'twenties and the late 'thirties, when short-time working was likely to have been of some importance, whereas overtime has been more the rule in the 1950's. Probably the figures for 1911-13 are not substantially affected. If this is so, then some part of the rise in output per employee-hour over the period reflects this inadequacy of the basic statistical information rather than the real change that took place. This qualification should be borne in mind in interpreting the results given below.

Before the first World War, weekly (standard) hours in manufacturing averaged nearly 49; by the late 'twenties they had fallen to about 45½, with a further fall to 44½ by the late 'thirties. In 1947, the standard working week averaged about 43 hours, and a 40-hour standard week came into general effect as from 1st January, 1948. Thus, average standard hours have fallen by some 18 per cent between 1911-13 and the early 1950's. Taking output on an "employee-hour" basis, the upward secular trend is distinctly more favourable than the annual output per head series indicates, as can be seen from Table IV.

TABLE IV

Changes in Output per Employee, Hours Worked and Output per Employee-Hour: All Manufacturing Industry

(Index numbers, 1947-8—1949-50 = 100)

Series	1911–13	1927/8-1929/30	1936/7-1938/9	1947/8-1949/50	1953/4-1954/5
1. Volume of Output per employee-year	73	90	103±5	100	124–125
2. Index of average weekly (standard) hours	121	112	110	100	99
3. Volume of output per employee-hour (a)	60	80	94	100	125–126

(a) Assuming the same number of weeks were worked *per annum* in each period.

The cumulative rate of progress from 1911-13 up to the late 'thirties was 1¾ per cent *per annum* in output per employee-hour. From the late 'thirties to the late 'forties the rate of growth fell to only ½ per cent *per annum*, and then recovered sharply to rather more than 4 per cent *per annum* in the period up to 1953-4—1954-5; however, if we take the whole period from the late 'thirties to the 'fifties, we find virtually the same rate of growth as in the earlier part of the period, viz. 1¾ per cent *per annum*.

Table V gives the rates of growth in output per employee-hour for each industry group separately. The consistently high rates for the energy sector, relative to other industry groups, is a marked feature of the whole period. Excluding energy, the average long-term rate of growth appears to be in the region of 1½ per cent *per annum*, cumulative.[8] The rapid rate of increase in labour productivity in the chemical trades since the late 'thirties is another outstanding feature. The fall in output per head in the metals and engineering industries during the 1940's has already been commented on; over the whole period since the outbreak of the Second World War, the upward trend in labour productivity in this group of industries appears to have been only slightly higher than in other manufacturing industries (apart from energy) taken together.

8. In view of the possible discrepancy between "standard" and actual hours of work, mentioned earlier, this rate of growth should be taken as a maximum figure.

TABLE V

Annual Average Cumulative Rates of Increase in Output per Employee-Hour

Per cent

Industry Group	1911–13 to 1927/8–29/30	1927/8–29/30 to 1936/7–38/9	1936/7–38/9 to 1947/8–49/50	1947/8–49/50 to 1953/4–54/5	1936/7–38/9 to 1953/4–54/5
1. Food, Drink and Tobacco	1·5	1·5	0·6	2·6	1·2
2. Textiles, Leather and Clothing ..	1·6	3·2	1·0	2·9	1·6
3. Chemicals and allied trades	0·2	−0·1	2·5	3·7	2·9
4. Metals and Engineering	0·5	2·5	−0·2	5·5	1·7
5. Building Materials ..	2·6	0·1	0·7	0·5	0·6
6. Paper, Printing, etc.	1·1	1·7	3·3	(5·0)	(3·9)
7. Energy	6·4–8·0	7·5	2·7	8·8–10·7	4·7–5·3
Total (a)	1·8	1·8	0·6	4·1–4·3	1·7–1·8
Total (a), excluding energy	1·4	1·5	0·6	3·8	1·6

(a) Incl. Miscellaneous trades, for which no volume index is available for 1953/4–54/5.

4. *Mechanization and Productivity of Labour*

Finally, it is of considerable interest to investigate the relationship between productivity changes in Australian industry and changes in the degree of mechanization. The *Production Bulletins* record the horse-power of engines ordinarily in use,[9] so that series for horse-power per person employed can be calculated. These are shown in Table VI, together with the corresponding series for output per employee-hour.

It is evident that, taking the entire period as a whole, a given increase in output per hour has required a more than proportionate expansion in mechanical or electrical motive power per head. For total manufacturing industry (excluding the energy sector) a regression of OPEH on EPE yields a regression coefficient of $0{\cdot}53 \pm 0{\cdot}05$ ($r = 0{\cdot}986$). Put in another way, the proportionate expansion in motive power was in fact getting on for double that in labour productivity.

For the period since 1936-7—1938-9, however, the series in Table VI suggest that a significant increase has taken place in output per unit of motive power[10] in the metals and engineering industries compared with the earlier period. It is not possible to compute a significant regression coefficient for only the last three periods covered by Table

9. The series for 1936-7 and later years relate to the rated h.p. of engines ordinarily in use, excluding duplication. For the earlier years, the official figures relate to the actual h.p. including duplication; these have been adjusted by reducing them in the proportion of rated h.p. excluding duplication in 1936-7-8-9 to the rated h.p. including duplication in the same years.

10. This ratio must not be taken as the inverse of the capital-output ratio, since motive power of engines does not provide a generally satisfactory measure of capital employed.

TABLE VI

Changes in Output per Employee-Hour (OPEH) and in Horse-power of Engines in Use per Employee (EPE)

(Index numbers, 1947-8—1949-50 = 100)

Industry Group	Series	1911–13	1927/8-1929/30	1936/7-1938/9	1947/8-1949/50	1953/4-1954/5
1. Food, Drink and Tobacco	OPEH	64±2	82±4	94±4	100	115
	EPE	33	59	93	100	128
2. Textiles, Leather, Clothing	OPEH	52±6	68±6	90±7	100	117
	EPE	19	39	68	100	129
3. Chemicals and allied trades	OPEH	75	77	76	100	122
	EPE	23	48	63	100	134
4. Metals and Engineering ..	OPEH	76	82	102±11	100	134
	EPE	24	53	84	100	115
5. Building Materials ..	OPEH	60	92	93±7	100	103
	EPE	23	53	81	100	134
6. Paper, Printing, etc. ..	OPEH	50	60	70	100	(131)
	EPE	11	24	57	100	138
Total, including Miscellaneous trades, but excluding Energy	OPEH	65	82	94±5	100	123
	EPE	23	51	78	100	126

VI for the metals and engineering group, but the evidence strongly suggests that such a coefficient would be in the region of unity (compared with the late 'thirties, the expansion in productivity is of the same order of magnitude as that in *per capita* motive power).

If this is a valid interpretation, it suggests that a remarkable change in some of the underlying forces, both technical and economic, may have been taking place over the past decade in the engineering sector. To what extent the substantially better showing in output per unit of motive power in the engineering industries has been due to economies of scale in a growing market, to the introduction of more advanced techniques, especially perhaps in new plants established by British or North American firms, to better organization, to greater labour skills, or to other relevant factors, can be only a matter for conjecture. But if the present phase of development continues, the future course of labour productivity may well lie above the previous long-term trend line discussed above.

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STATISTICAL ANNEX

The growth of Australian manufacturing industry is documented in the annual *Production Bulletins* published by the Commonwealth Statistician. Prior to the First World War, the published statistics on output related essentially to gross output, materials and fuel purchased and value added in each of the main industries.[11] In addition, a table was published each year, giving the quantities and selling values of the most important individual products, thus enabling unit values to be calculated. The scope of this latter table was restricted almost entirely to products of the food and drink and textile trades before the first war, and its scope was only very gradually extended during the 1920's and early 1930's.

A big improvement was effected as a result of the Conference of State Statisticians in 1935, and after 1936-7 a considerably wider variety of individual products were listed both by quantity and selling value.[12] Since the end of World War II, further improvements have been made, the most recent *Bulletin* (for the early 1950's) containing product data for over 1,000 individual items. For the entire period, the quantity (but not the selling value) of gas sold, and of electricity generated, was published.

With such wealth of statistical data available, it seems surprising that Australia remains one of the few important industrial countries which do not have an official index of production. An index of the volume of manufacturing production was, indeed, published by the Commonwealth Statistician in the *Production Bulletins* in the period before the First World War and was continued up to 1928-9. It was then discontinued as being misleading since the method of construction "practically assumes that there has been no change in productive efficiency".[13]

There have been several index numbers published by private investigators in recent years, using the data in the *Production Bulletins*. The most notable of these so far has been the annual index presented by Dr. S. P. Stevens in a paper read before the 1953 meeting of the Australian and New Zealand Association for the Advancement of Science.[14] Dr. Stevens' method was to construct an aggregative index of the value of net output at constant prices in each industry and industry group as shown in the official statistics; this he did by multiplying quantity relatives for individual commodities produced in each year by the estimated net output of each in the base year. His series begin in 1945-6 and end in 1952-3.[15]

Another useful contribution to the subject has been made by Mr. W. E. G. Salter,[16] but his index numbers cover only a relatively short period (1945-6 to 1949-50). The only published attempt so far to construct an index number of the volume of manufacturing production in Australia extending from before the First World War up to the outbreak of the Second was made by Folke Hilgerdt in his classic study of industrialization and trade.[17] His method was a crude one, but it sufficed for his purpose of making broad comparisons between movements in production and trade. He arrived at his volume index by dividing an index of the gross value of all manufacturing production by a price index. The deflator employed was an unweighted arithmetic average of the Melbourne wholesale price index and the

11. There were about 100 separate industries distinguished in the *Production Bulletin* for 1913, for example.

12. This was not the only improvement to the published statistics which resulted from that Conference.

13. *Production Bulletin No. 24* (1929-30). The method used was based on the construction of a composite index of the number of employees, the horse-power of engines and the ratio *per cent.* of the margin for profit and miscellaneous expenses to the value added in manufacture.

14. A summary of this paper was published in the *Economic Record*, May, 1954.

15. The index numbers for 1952-3 given in his paper were based on monthly data and not on the annual Production Bulletin; they are not reproduced in the *Economic Record*.

16. W. E. G. Salter, *The Measurement of Australian Industrial Production* (1954).

17. *Industrialization and Foreign Trade, League of Nations*, 1945.

official index of nominal wage rates for adult males (Australian average).[18] Hilgerdt presented volume index numbers for each year from 1908 to 1913, and from 1920 to 1938.

For any more detailed study of the longer-term trends in Australian production and productivity, it is necessary to examine volume changes in the different industries separately. However, an aggregative index of the type used by Dr. Stevens cannot be computed because, as mentioned earlier, the data for individual products are relatively sparse in the period prior to 1935-6, being largely confined—apart from gas and electricity—to the food and drink and textile trades.

Nevertheless, it seemed worth-while attempting to produce a series of volume index numbers for the main industry groups on the basis of such commodity detail as was available. The method of construction used is described below.

Method of Construction

There were three major decisions to be taken at the outset. The first concerned the form of the index numbers; the second the selection of commodities; and the third, the system of weighting to be used.

(a) *Form.* As mentioned earlier, the *Production Bulletins* give information about quantities and selling values of a selection of commodities. They also give quantitative data (but not selling values) about a considerable number of additional commodities. Had the list of commodities with quantitative information been fairly comprehensive, it would have been possible to construct aggregative index numbers of the volume of production on the lines of Dr. Stevens' index. But there are clearly too many gaps, particularly in the period up to World War II, for this to be done. An index based on the quantitative information published would imply that the *volume* change in omitted items was similar to that for the items included; and this cannot be accepted as a reasonable assumption in view of the growing diversity of Australian industrial production in this period and the different rates of change in the output of various commodities.

It is much more reasonable to assume that the *price* change in omitted items is similar to that for items included in the calculation. This is particularly so in periods of relative stability in price, or of small variation in the price relatives of commodities produced by a given trade. The obvious disadvantage of this approach in the case of Australia is that it is necessarily based on the smaller number of commodities for which both quantity and value are published. Even so, it seems likely that index numbers based on this assumption will be more reliable than any which assume similarity in volume movements.

For this reason, it was decided to construct unit value index numbers for as many separate trades as possible, and to use these to "deflate" the recorded (gross) value of output of these trades. The totals for the separate trades were aggregated into totals for each industrial group,[19] and the resulting values at constant prices were then converted into volume index numbers.

(b) *Selection of Commodities.* In the earlier years, virtually the entire list of commodities for which both quantities and values were shown have been included in the calculation. For 1948-9, the number of possible candidates for inclusion was considerably larger, but the selection of items to be included in the unit value calculations was necessarily determined by the availability of comparable data for 1937-8.

The unit values were calculated for only the middle years of each group; price change *between* each of the three years in any group have generally been ignored.[20] The movement in prices from one group of years to another was in every case very considerably greater in amplitude than the movement within each triennial period. Moreover, prices in the middle years were very close to annual average prices for

18. *Ibid*, p. 144.
19. See Appendix I for a list of trades included in each group.
20. For a few items, however (e.g. gas and electricity) the data for *all* the years listed have been used.

each group of three years, so far as can be judged from the published wholesale price index numbers. Thus, the method adopted is unlikely to be significantly less reliable than the use of unit values for all the years covered, while allowing a considerable saving in labour and time to be made in compiling the index.

(c) *Weighting.* Allowance had to be made for the changes in the relative importance of different products that had occurred over the period of some 35 years covered by the index. The procedure adopted was to calculate separate index numbers linking each consecutive pair of years, using both Paasche and Laspeyres formulae; geometric means of the resulting index numbers were then linked to the average of the years 1947-8—1949-50 as comparison base. This method of weighting was used at all stages—for example, in the construction of the unit value indices for individual trades (where two or more commodities had been selected for a given trade), and in the combination of trades to yield indices for trade groups.

Coverage. For the first "link" (between 1911-13 and 1927-8—1929-30), 55 per cent of total gross industrial production was covered by the groups for which unit value index numbers could be computed. The corresponding proportion for the second "link" was rather higher (61 per cent in 1927-8—1929-30 and 56 per cent in 1936-7—1938-9). For the third "link", the proportion was about 90 per cent. The volume movement for those groups for which unit value indices could not be computed was estimated by deflating the value of output by index numbers based on appropriate wholesale price or wage rate changes.

For the groups where unit value series were computed, the proportion of total output represented by the individual commodities included in the unit value calculations varied substantially from one group to another. Table S.A./I shows the

TABLE S.A./I

Proportion of Gross Output Represented by Commodities Included in Unit Value Calculation[a]

Per cent

Industry Group	1st Link	2nd Link	3rd Link
1. Food, Drink and Tobacco	61·3	59·3	70·0
2. Textiles, Leather and Clothing	38·7	26·2	33·2
4. Metals and Engineering	..	..	15·7
5. Building Materials	..	22·3	27·3
7. Energy	94·5	93·1	80·5
8. Miscellaneous factory trades	..	..	20·9

(a) The proportions shown are means of the proportions in base and later periods of each link.

"coverage", in this sense, for the groups concerned. In energy and in the food, drink and tobacco trades, the coverage is relatively high; it is least in metals and engineering and in the miscellaneous factory trades. For only two groups does the coverage exceed 50 per cent of gross output. For all the other groups, the coverage is less than this, being in some cases in the region of 15-20 per cent. In view of the relatively low coverage in some groups, and particularly in the important metals and engineering group, standard errors were calculated for the unit value index for each group.

Standard Errors. The primary purpose of computing standard errors is of course to provide approximate margins of error in the index numbers, which can be attributed solely to the fact that the calculation is based on a selection of commodities and not on the entire range of output. There may well be other elements of error present, apart from purely "sampling" ones.

Since the unit value index for each trade is based on "price" ratios for a selection of commodities, it would be possible in theory to compute the variance of these

ratios for each trade. Thus, we would have variances σ_1^2, σ_2^2, ... σ_n^2 for individual trades within a given industry group. However, since the number of commodities within each trade was generally small, it has been assumed for each industry group and for each link of years separately that these "trade variances" are equal to each other, apart from the coverage and weighting factors which differed from trade to trade. Thus, it was required to calculate a "within-trade" variance for each industry group and each link of years. Let this "within-trade" variance be denoted by σ_t^2. Then, the variance of the unit value index for a given trade can be expressed as:

$$V(P_k) = \Sigma\left(\frac{\partial P_k}{\partial \pi_i}\right)^2 \cdot \sigma_t^2 (1-c) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

(where c = the proportion of the output of a given trade represented by the items included in the calculation), if only the price ratios (π_1, $\pi_2 \ldots \pi_n$) are subject to errors, which are uncorrelated between items.

The trade index P_k is a geometric mean of base and current weighted index numbers, P_0 and P_1.

Thus, $P_k = \sqrt{P_0 P_1} = \sqrt{\dfrac{\Sigma(w_0\pi)}{\Sigma(w_1/\pi)}}$

where w_0 is a base weight $= \dfrac{p_0 q_0}{\Sigma(p_0 q_0)}$

and w_1 is a current weight $= \dfrac{p_1 q_1}{\Sigma(p_1 q_1)}$

Then, $\dfrac{\partial P_1}{\partial \pi_1} = \dfrac{\partial P_1}{\partial u} \cdot \dfrac{\partial u}{\partial \pi_i}$ where $u = \Sigma\left(\dfrac{w_{1i}}{\pi_i}\right)$

$$= \frac{1}{u^2} \cdot \frac{w_1}{\pi_i^2}$$

$$= P_1^2 \cdot \frac{w_1}{\pi_i^2}$$

$$= \frac{P_1}{\pi_i} \cdot \frac{(w_1/\pi_i)}{\Sigma(w_1/\pi_i)}$$

Similarly, it can be shown that $\dfrac{\partial P_0}{\partial \pi_i} = \dfrac{P_0}{\pi_i} \cdot \dfrac{w_0\pi_i}{\Sigma(w_0\pi_i)}$

and $\dfrac{\partial P_k}{\partial \pi_i} = \dfrac{P_k}{\pi_i} \cdot \dfrac{1}{2}\left(\dfrac{w_0\pi_i}{\Sigma(w_0\pi_i)} + \dfrac{w_1/\pi_i}{\Sigma(w_1/\pi_i)}\right)$

Thus equation (1) can be reformulated as:

$$V(P_k = P_k^2\left[\Sigma\left(\frac{1}{2\pi_i} \cdot \frac{p_{1i}q_{oi}}{\Sigma(p_1 q_o)} + \frac{p_{oi}q_{1i}}{\Sigma(p_o q_1)}\right)\right]^2 \cdot \sigma_t^2(1-c) \quad \ldots\ldots\ldots\ldots \quad (2)$$

The variances of the index numbers for each trade were calculated in this way. The variance of the index for a trade group, $V(P_g)$, was calculated on similar lines:

$$V(P_g) = P_g^2 \cdot \Sigma\left[\frac{1}{2P_k}\left(\frac{p_1 q_o}{\Sigma(p_1 q_o)} + \frac{p_o q_1}{\Sigma(p_o q_1)}\right)\right]^2 \cdot \sigma p_k^2 \quad \ldots\ldots\ldots\ldots\ldots \quad (3)$$

where $p_1 q_o$ and $p_o q_1$ now refer to the revalued totals for individual trades.

For the final "link" (late 'thirties to late 'forties), the variance of the total unit value index for all manufacturing industry was computed by carrying this process one stage further, this time using net outputs (i.e. "value of production") as weights. Table S.A./II summarizes the results.

The unit value index numbers were "chained" to a comparison-base of 1947-8—1949-50. This series is given in Table S.A./III, which also shows the assumed unit values for those industry groups for which census data were not available. Appendix Table II gives the relevant wholesale price and wage-rate series.

TABLE S.A./II

Industry Group	Comparison	n	P_g	σ_t^2	$V(P_g)$	$\sqrt{V(P_g)}$
		(No. of items)				
1. Food, Drink and Tobacco ..	1928/9 (1912=100)	15	163	61	7·99	±2·83
	1937/8 (1928/9=100)	22	82	17	16·02	±1·27
	1948/9 (1937/8=100)	33	164	379	22·09	±4·70
2. Textiles, Leather & Clothing ..	1928/9 (1912=100)	7	169	154	44·60	±6·68
	1937/8 (1928/9=100)	8	71	56	14·74	±3·84
	1948/9 (1937/8=100)	40	237	1,766	382·30	±19·50
4. Metals & Engineering	1948/9 (1937/8=100)	51	192	1,774	121·22	±11·01
5. Building Materials	1937/8 (1928/9=100)	4	98	197	88·29	±9·40
	1948/9 (1937/8=100)	13	192	915	103·38	±10·17
8. Miscellaneous factory trades..	1948/9 (1937/8=100)	20	233	3,309	1,025·63	±32·03
Total	1948/9 (1937/8=100)	186	191	(a)	27·94	±5·29
Total, excluding Energy		183	194	(a)	32·69	±5·72

(a) For the Total, this column is represented by the values for $V(P_g)$ shown against the separate groups. In addition, 3 arbitrary variances were included: 10 for the Energy group, 100 for Paper, Printing, etc., and 500 for Chemicals. These 3 groups represented nearly one-fifth of total net output of all manufacturing industry in 1948/9.

TABLE S.A./III

Unit Value Indices of Industrial Production[a]

(Index numbers, 1947-8—1949-50 = 100)

Industry Group	1911–13	1927/8-1929/30	1936/7-1938/9
1. Food, Drink and Tobacco	46±3	74±4	61±2
2. Textiles, Leather and Clothing	35±5	59±7	42±4
3. Chemicals and allied trades	34	66	63
4. Metals and Engineering	33	60	52±3
5. Building Materials	32	53±6	52±3
6. Paper, Printing, etc.	31	63	57
7. Energy (b)..	100–145	109	71
8. Miscellaneous factory trades	25	49	43±7
Total	37—38	63	53±2
Total, excluding Energy	35	61	52±2

(a) Index numbers shown without standard errors (except those for Energy) are based on relevant wholesale price or wage rate series (*see* Appendix II); in general, such index numbers can be assumed to have greater margins of error than those based on census unit value series.

(b) The standard errors for the Energy indices can be taken as negligible.

Standard errors were assigned to volume index numbers wherever they had been computed for the associated unit value indices. Writing v for volume, w for value and u for unit value, we have

$$v = \frac{w}{u}$$

$$\text{and } \frac{dv}{v} = \frac{dw}{w} - \frac{du}{u}$$

$$\frac{\sigma v^2}{v^2} = \frac{\sigma w^2}{w^2} + \frac{\sigma u^2}{u^2} - \frac{2\sigma wu}{wu}$$

$$\text{so that } \sigma v^2 = v^2 \left[\frac{\sigma w^2}{w^2} + \frac{\sigma u^2}{u^2}\right]$$

if w and u are uncorrelated so that the final term can be ignored.

In the present case, $\sigma_w^2 = 0$, since w relates to the recorded statistics of output which, for practical purposes, we can assume to have a zero (or negligible) error.

Thus we can write:

$$\sigma^2 v = v^2 . \frac{\sigma u^2}{u^2}$$

$$\text{and } \sigma v = v . \frac{\sigma u}{u}$$

In much the same way, it can be shown that the variance in the indices for annual output per person employed (z) =

$$\sigma z^2 = z^2 \left[\frac{\sigma v^2}{v^2} + \frac{\sigma e^2}{e^2}\right]$$

where e = numbers employed. Since σ_e^2 can be taken as zero in this case,

$$\sigma z^2 = z^2 . \frac{\sigma v^2}{v^2}$$

$$= \left(\frac{v}{e}\right)^2 . \frac{\sigma v^2}{v^2}$$

$$= \frac{\sigma v^2}{e^2}$$

$$\text{and } \sigma_z = \frac{\sigma v}{e}$$

For output per employee-hour (z'), the variance is:

$$\sigma z'^2 = \frac{\sigma v^2}{(eh)^2} \text{ where } h = \text{number of hours}$$

$$\text{and } \sigma z' = \frac{\sigma v}{eh}$$

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APPENDIX I

CLASSIFICATION OF INDUSTRIES

Industry Group	1911-13 and 1927-8—1929-30	1936-7—1938-9 and 1947-8—1949-50a
1. Food, Drink and Tobacco	Food, Drink and Tobacco group Chaff Cutting Sausage Skins	Food, Drink and Tobacco group
2. Textiles, Leather and Clothing	Clothing and Textile Fabrics group Tanneries Woolscouring and Fellmongering Leatherware	Textiles group Skins and Leather group Clothing group
3. Chemicals	Drugs and Chemicals, etc., group Boiling Down, etc. Oils and Fats, etc., group Explosives	Chemicals, Dyes, Explosives, etc., group *less* Mineral Oils
4. Metals and Engineering	Metal Works, Machinery etc., group Arms Vehicles group Ships, etc., group Electric Apparatus Lamps	Industrial Metals, etc., group
5. Building materials	Bricks, Tiles, etc. Glass (ornamental) Lime, Plaster, etc. Joinery, Boxes Sawmills Marble, Slate, etc.	Lime, Carbide, Plaster Asphalt, Marble, Slate Cement and Cement Goods "Other" from group I Bricks and Tiles Glass (other than bottles) Sawmills Plywood Mills Joinery
6. Paper	Books, Paper, etc., group	Paper, Stationery, etc.
7. Other factory industry	Total (less those specified elsewhere)—chiefly Rubber Brooms and Brushes Furniture Precious Metals	Total (less those specified elsewhere)—chiefly Rubber Brooms & Brushes Furniture Precious Metals
8. Energy	Electric Light and Power Gas, Kerosene and Coke Works Hydraulic Power	Coke Briquetting Mineral Oils Gas Electric Light and Power

(a) This classification was also used, so far as possible, for 1953-4—1954-5.

APPENDIX II

UNIT VALUES, PRICES AND WAGE RATES

The following table compares the unit value series derived from Census data with price and wage rate series for those industry groups for which such comparisons are possible. For the paper, printing, etc., group, only wage rate data are available from official sources.

There are two wholesale price series to choose from for several of the industrial groups. The Melbourne series are index numbers with 1911 weights, and are available annually back to 1861. A new series of wholesale price index numbers of basic materials and foodstuffs is also available, with figures back to 1928; the weighting used is based on average annual consumption during the years 1928-9 to 1934-5, inclusive. Thus neither index uses weights at all comparable with the method of linked weighting which has been used in the present note to compute unit value indices from census data. However, the general trend in prices, as shown by these indices, can probably be taken as a crude "consistency check" on the validity of the computed unit value indices.

For the textiles, leather and clothing group, the official retail price index for clothing is also shown.

(Index numbers, 1948-9 = 100)

Industry group/series	1912	1928/9	1937/8	1948/9
1. *Food, Drink and Tobacco*				
a. Census unit values	46	74	61	100
b. Wholesale Prices:—				
"Melbourne" Index—				
(i) Agricultural produce	52	67	65	100
(ii) Dairy produce	55	82	68	100
(iii) Groceries	42	68	70	100
Foodstuffs and Tobacco	..	63	57	100
c. Wage rates	34	66	61	100
2. *Textiles, Leather and Clothing*				
a. Census unit values	35	59	42	100
b. Wholesale prices:—				
"Melbourne" Index (a)	26	44	32	100
Basic Materials Index (b)	..	38	30	100
c. Wage rates	32	64	58	100
d. Retail Clothing prices	41	53	45	100
3. *Chemicals*				
b. Wholesale prices:—				
"Melbourne" Index	30	60	63	100
Basic Materials Index	..	74	63	100
4. *Metals and Engineering*				
a. Census unit values	..	..	52	100
b. Wholesale prices of *Metals and Coal*:—				
"Melbourne" Index	32	61	56	100
Basic Materials Index	..	69	55	100
c. Wage rates	35	66	61	100
5. *Building Materials*				
a. Census unit values	..	53	52	100
b. Wholesale prices:—				
"Melbourne" Index	23	38	51	100
Basic Materials Index	..	48	51	100
6. *Paper, Printing, etc.*				
c. Wage rates	34	66	61	100

(a) Wool, cotton, leather, etc.
(b) Textiles.

BANKRUPTCIES IN DEPRESSION AND BOOM

1. *General*

In recent years a somewhat disturbing trend has appeared in the New Zealand economy. There has been a steady growth in the number of bankruptcies,[1] from only 45 in 1945 to 373 in 1956. This has occurred in a period of definite inflationary pressures, yet the level is roughly similar to that in the second half of the Great Depression, i.e. 1934, 1935 and 1936, when the corresponding figures were 326, 257 and 260. The present study has been motivated by this curious paradox and by the widely-spread belief that freeing of imports at the end of 1954, and the more recent "credit squeeze", has pushed some businesses into insolvency.

The absolute bankruptcy figures, as well as the crude bankruptcy rate per thousand of population, show a rather strange record. 1879 had the highest number of bankruptcies on record in New Zealand history—1836—and, although the figures drop somewhat subsequently, they remained high until 1888. In this century, the highest figure is only 867, reached in 1927, and the highest figure for the Great Depression, 848, is reached in 1931. If we take the crude bankruptcy rate, the record is even more strange. In 1879 not less than 3·6 people in each thousand went bankrupt, a truly remarkable figure, but in 1927 the figure was only 0·60, and in the worst year of the Great Depression it was only 0·56.

There may be several partial explanations of this situation. It is probable that in the very early period, when almost all the non-Maori population were immigrants, the ratio of bread-winners to dependants was much higher than it is now.[2] Since it is not easy for a dependant to go bankrupt this might help, in a very small way, to account for the relatively low bankruptcy *rate* today. Part of the explanation may also lie in the fact that bankruptcy laws have changed and, even more, the attitudes of courts and officers administering them. To some extent the bankruptcy series have also been affected during the nineteenth century by other changes in law, altering the attractiveness of private compositions relatively to bankruptcy orders. But such incomplete series as exist suggest that this makes only a small difference.

There has also been a marked increase in the proportion of business done by companies, and since company liquidations are not included in New Zealand bankruptcy figures (their statistics have not even been collected until recent years), this might make some difference. But the difference cannot be much, because company liquidations have not been numerous.

1. For figures of bankruptcies, 1879-1955, see the N.Z. *Official Year Book;* for the 1956 figure see the *Monthly Abstract of Statistics,* May, 1957.

2. In the same way (or may be even more so) as, today, immigrants show a higher ratio of bread-winners to dependants than the locally-born population does.

All this may mean that bankruptcy figures, although often used as indicators[3] of economic activity, are an imperfect measure. It may also be that, contrary to conventional belief, the present-day New Zealander is far more honest, reliable, thrifty, serious-minded and responsible than his Victorian counterpart.[4] Alternatively, the figures might suggest that the term, the Great Depression, for the inter-war depression, is a misnomer.

A detailed and careful case study of all bankruptcies during 1954 and 1955 in the Auckland District (which normally contributes between a third and a half of all bankruptcies in New Zealand), summarized in later pages, shows conclusively that in the two years under discussion no bankrupt claimed, or could possibly claim, that his misfortune was caused directly by the credit squeeze. While it is true that somewhat less than 2 per cent of bankrupts did mention during cross-examination, *inter alia*, that their bank had recalled their overdraft, it was established[5] beyond doubt that the bank recalling credit realized that the customer was already on the verge of bankruptcy through other causes, and only tried, rather belatedly at that, to save its money before the customer dissipated such substance as was left, or other creditors stepped in. In any case, the typical bankrupt business is a very small establishment, most often a one-man affair, having hardly any overdraft.

The finding that the credit squeeze was not a *direct* cause of bankruptcies does not, of course, dispose of the argument that they may be the indirect effects of the credit squeeze and, perhaps, of the relaxation of imports at the end of 1954. Some such belief regarding the direct or indirect effect of recent economic policies is strongly held (on *a priori* grounds, of course) by a large number of even well-informed people. Such a solid publication as the N.Z. *Official Year Book* (1954, 1955, 1956) seems to express such an opinion.[6] Yet there are several features in the situation which make it difficult to accept this facile explanation.

In the first instance, although in recent years the inflationary gap in New Zealand tended to be narrowed, its continued existence is proved by rises in the cost of living and a level of demand which threatened "overseas funds". Surely this is not a situation that is usually supposed to contribute to bankruptcies.

Secondly, about 6 per cent of bankrupts in 1954 and 1955 actually claimed that their bankruptcy was caused by shortages of men and materials, and did not complain of any excessive difficulty in selling.

3. See the *Monthly Abstract of Statistics* of N.Z.

4. It is interesting to note that, for example, the number of court convictions for drunkenness in New Zealand was practically the same in 1890 as in 1954, this in spite of the fact that population in the latter year was more than three times as large. The number of prisoners was almost twice as great in 1890 as in 1954. For both of the series, see the N.Z. *Official Year Books*, 1893-1956.

5. This was done by a careful study of the books of the bankrupt, of his written statement, of the lists of his debts and assets, and of his statement on oath during the cross-examination by the Official Assignee and the creditors.

6. "During the later war and immediate post-war years the number of bankruptcies was exceptionally low, extremely buoyant conditions prevailing throughout this period. Since 1947 there has been a decided upward trend. . . ."

TABLE I

*Bankruptcies in New Zealand by Occupational Status**

Year	Salary or Wage-earner	Own Account	Total
1945 ..	22	23	45
1946 ..	16	36	52
1947 ..	27	47	74
1948 ..	48	100	148
1949 ..	52	127	179
1950 ..	44	98	142
1951 ..	61	83	144
1952 ..	64	103	167
1953 ..	91	123	214
1954 ..	103	160	263
1955 ..	108	184	293†

* N.Z. *Official Year Book* 1956 (p. 1127)
† Includes one retired person.

Thirdly, Table I shows that the recent rise in "business" bankruptcies was paralleled by a similar rise in "personal" or "household" bankruptcies (i.e. involving wage-earners). Since wage-earners have not been hurt by the credit squeeze, nor by the relaxation of import controls (not one wage-earner went bankrupt in 1954 and 1955 because of inability to get work, and not one bankrupt blamed loss of overtime earnings), and since they may have been, on the contrary, helped by this let-up in inflation, the credit squeeze could not have been the factor. This conclusion is greatly strengthened when we consider the fact that a very large proportion of recent "business" bankruptcies (even in the case of owners of businesses) are really "personal", or "household" bankruptcies.

Fourthly, outside wage-earners, the industry having the greatest growth and actual number of bankrupts is building, an industry which has been protected from the credit squeeze and which could have been only favourably affected by freer imports on the supply side, and which has not suffered any general decline of demand.

TABLE II

*Building Permits in New Zealand**

Year	Private Dwellings		Total *All* Buildings Value £ mil.
	Number	Value £ mil.	
1946 ..	10,356	14	21
1947 ..	12,876	18	27
1948 ..	14,048	21	29
1949 ..	16,136	26	36
1950 ..	17,657	29	42
1951 ..	17,849	33	48
1952 ..	17,111	36	59
1953 ..	16,217	37	61
1954 ..	17,457	42	69
1955 ..	20,863	53	93

* *Source*: Report on the Population, Migration and Building Statistics for 1954-5.

The other group showing a number of bankruptcies comparable with the building industry is distribution. In this case it is conceivable that the squeeze might have been influential, but there are two reasons for thinking it was not, in fact, significant—shopkeepers do not rely to any real extent on bank credit, and consumption is not financed by overdraft. Moreover, the relaxation of import controls and the consequent greater variety of goods could have only favourable effects on shopkeepers, whatever the effects might be on importers and manufacturers.

Fifthly, during the post-war period, there has been an uninterrupted growth of national expenditure in New Zealand. This has been most striking in building, but the turnover of retailers has also increased and retail stocks have risen only very slightly in the last few years. Yet these two industries had the greatest incidence of bankruptcies.

Although a detailed study on the above lines has not been made for 1956, a preliminary study suggests a similar position. This does not of course mean, however, that any further and considerably stronger credit restriction would not increase bankruptcies.

2. *Case Study of Bankruptcies in the Auckland District*

In order to find the distribution of bankruptcies among various industries and, especially, to find their causes, a detailed study was made of each person who went bankrupt in 1954 and 1955 in the Auckland District.[7] In addition, for comparative purposes, an analogical study was made for 1931 (taken as the trough of the Great Depression).

In order to find relative bankruptcy-proneness in various industries the number of bankruptcies (of the Auckland District) in each industry was related to the total number of business units in New Zealand.[8] A bankruptcy rate for businesses in each industry, and for wage-earners, was then calculated on this basis. Next the actual bankruptcy rate in each industry was expressed as a multiple of the actual bankruptcy rate for wage-earners and salaried people so as to obtain an index of Relative Bankruptcy-Proneness.

Some conclusions on bankruptcy proneness follow:

(a) Bankruptcy proneness is far greatest in the tree-cutting and saw-milling industry, the transport industry, the construction industry, and, to a lesser extent, in the motor repair and ser-

7. This study was made possible by the courtesy of Mr. T. C. Douglas, the Official Assignee in Bankruptcy of the Auckland District, who kindly made available to me his files. Each file contains a written statement by the bankrupt regarding the causes of bankruptcy, written claims for specified goods and services lodged by creditors, a list of debtors, a verbatim account of cross-examination of the bankrupt under oath by the Official Assignee and the creditors, and finally a report of the Official Assignee on each case.

8. In view of the fact that the statistics of bankruptcies for the whole of New Zealand do not give a suitable breakdown, statistics of the Auckland District had to be compared with the number of business units in New Zealand. It is probable that the relative distribution of business occupations in Auckland District is not so different from that of New Zealand as to give a misleading result here.

TABLE III

Index of Relative Bankruptcy-Proneness

Base: Bankruptcy Rate of Wage-earners and Salaried People = 1

Industry	1931 Bankruptcies related to No. of business units at 1926 Census	1931 Bankruptcies related to No. of business units accdg. to Incomes and Income Tax Stat. Report 1930-1	1954 Bankruptcies related to 1951 Census No. of business units	1955 Bankruptcies related to 1951 Census No. of business units
Wage-earners and salaried people	1	1	1	1
Shopkeepers, hawkers, dealers, etc.	53	60	32	32
Transport	66	278†	13	25
Construction	54	276†	45	45
Tree cutting and saw-milling	84	n.a.	59	157
Farming and ancillary ..	8	7	1·6	1·6
Motor repair and servicing	526*	n.a.	16·6	47
Manufacturing	8‡	75	10·7	10·3

* This extremely high figure for the motor repair and servicing industry can be explained, in part, by the fact that 1931 bankruptcies are related to the 1926 number of businesses. There are no Census statistics for 1931 and it is obvious that between 1926-31 the number of business units in that industry must have by far outpaced the growth (if any) in other industries. In part, however, this high figure for bankruptcy proneness is a true expression of the industry's sensitivity to cyclical fluctuation.

† The bankruptcy proneness of these two industries, calculated on the number of business units in the 1926 Census, although very high relatively to other industries, is not nearly so high as a calculation on the basis of the number of business units given for 1930-1 in the Statistical Report on Incomes and Income Tax. The reason is that by 1930-1 there was a most dramatic fall in the number of business units. These two industries are extremely cyclically sensitive to growth and decline.

‡ The very low figure for bankruptcy proneness of manufacturing, calculated on the basis of the number of manufacturing units given in the 1926 Census, can be explained by the fact that the 1926 number of units had, in this case, become a grossly inaccurate guidance by 1931. By that time, according to the Incomes and Income Tax Statistical Report for 1930, the number of manufacturing units seems to have been whittled down, mainly by voluntary liquidations, one man units converting into wage-earners or unemployed, and also by bankruptcies in the intervening period, to something like one-tenth of what it was in 1926.

vicing industry.[9] These industries lead in this respect, both during boom and depression. Retailing has a consistently high bankruptcy proneness all the time.

(b) The fact that wage-earners and salaried people have the lowest bankruptcy proneness does not mean that they are more rational, or that they have a higher moral code for debts. Only persons who are able to contract relatively very large debts can go bankrupt at all, or can find it profitable to apply for a bankruptcy order.

(c) The bankruptcy proneness of farmers is consistently and extremely low, whether in boom or depression; in fact, during a boom the rate is practically the same as for wage-earners. A plausible, though not really satisfactory explanation is that during the recent boom farmers have been getting extremely

9. Builders have unquestionably the highest bankruptcy incidence also in Great Britain, and shopkeepers also show a very high rate. See *Bankruptcy General Annual Report* for 1956, H.M.S.O.

high prices for produce. But since high prices for produce mean high prices for land and stock (and high mortgages), people who went into farming during the boom might, nevertheless, find the going hard. Moreover, high income is not necessarily a guarantee that a person will not go bankrupt, judging by a large number of bankrupts studied. Above all, during the Great Depression the drop in prices of farm produce was greater than the drop in prices of many other goods, and yet farm bankruptcy proneness was low. This low figure cannot be explained by the Mortgages Relief Act of 1931 because this measure does not seem to have had much effect on farm bankruptcies in that year, in fact, farm bankruptcies rose very greatly in 1931 compared with the preceding year. The general explanation here, however, must be that, like the wage-earner (although for different reasons), the New Zealand farmer does not depend on credit so much as other industries do. The farmer in New Zealand who employs hardly any wage labour, when pressed by economic circumstances, can and will tolerate a very great reduction in his own income. There may also, of course, be a somewhat stricter moral code in the country than in towns.

(d) The bankruptcy proneness of manufacturers, though many times greater than that of farmers, is roughly about half to a quarter that of the construction and transport industries.

(e) It is curious that the bankruptcy rate of wage-earners seems to be practically constant in boom and in depression, although the *cause* of bankruptcy would change. There is, however, an important qualification. If we take the war periods, and especially the last World War, the bankruptcy rate of all groups is extremely low, and for two reasons. During such wars, personal and household spending is kept down, thus reducing one cause of bankruptcy and, further, a very substantial proportion of the people who might go bankrupt is in camp with very little opportunity of incurring substantial debts.

3. *Bankruptcy Figures as an Indicator of Economic Pressures*

Whatever might be the effects of economic policies and economic conditions on bankruptcy rates, there are several serious objections to using them as an indicator of inflationary or deflationary pressures.[10]

(a) Bankruptcy figures do not include a very large number of one-man business firms which go out of business voluntarily, often under economic pressure, where the owner just manages to pacify his creditors by full payments, or otherwise. No official record of this, probably the largest part of business mortality, is kept.

10. It is interesting to note that, according to *Bankruptcy General Annual Report* (H.M.S.O.), bankruptcies actually dropped in Great Britain in 1956, i.e. during the credit squeeze, to reach their lowest figure since 1948!

TABLE IV

*Frequency of Known Factors Probably Contributing to make People go Bankrupt**

(Auckland District)

	1931	1954	1955
Starting with no, or little, capital	47	41	35
Lack of experience or education, bad judgment, low intelligence	30	59	78
Illness, or invalidity	29	22	19
Bad luck	20	17	11
Drinking excessively†	1	11	14
Motor car accident	8	3	5
Gambling†	8	9	8
Living at extravagant level	4	17	12
Large family and low income	5	6	11
Domestic trouble	1	8	14
Shortage of men and materials	0	8	6
Bank recalling credit	2	2	0
Probable dishonest attempt†	2	8	n.a.
Falling demand and price	65	0	0
Unemployment	9	0	0
Bad debts	9	0	0

Estimated on the basis of bankruptcy files of Auckland District.

* In some cases there appeared to be only one cause, in others there were several; all causes that appeared to have been operative are included in the table.
† Very likely grossly underestimated.

(b) They do not normally include company liquidations, though recently statistics of court orders for company liquidations have come to be published and could be included. (It has to be admitted that their number has recently been small and has probably not varied much in the last few years.) Similarly, private assignments and compositions are not normally included, but could also be included as statistics are available.

(c) Since it takes a considerable period of time, sometimes several years, before the debtor himself sees that he is in a bad way, and before he becomes convinced that he cannot make good, and even longer probably before creditors see what is happening, it follows that the bankruptcy crop at any time is, to a large extent, the result of conditions a few years earlier. This time lag condemns bankruptcy figures as a business indicator on the ground of their insensivity as a record of business changes. In 1931, for example, in at least 40 bankruptcies out of a total 127 in the Auckland District, the bankrupt was virtually insolvent two or more years before he was adjudged bankrupt. In 1954 at least 17 bankrupts out of the total 107 were insolvent two or more years earlier; in 1935, 37 bankrupts out of 111 were insolvent two or more years earlier.

(d) An important feature of bankruptcies is that a very large proportion of businesses going bankrupt are usually quite new businesses. In 1931, at least 39 firms in a total of 90 "business"

bankruptcies in the Auckland District, were less than two years old; in 12 cases there was no relevant information on record. In 1954 the proportion was 34 firms in a total of 80 "business" bankruptcies, and in 1955 at least 42 firms out of a total of 87 "business" bankruptcies; in 14 cases there was no relevant information on the file.

(e) It would appear then that while a high bankruptcy rate might be expected during depression, bad trade conditions are not the only cause of it. The evidence in the preceding paragraph, together with such statistics of "business birth rates" as are available, suggests that bankruptcies in any given period are in part a function of the number of business units established a few years before, and in part a function of a particular kind of business expectation, namely a sort of financial recklessness engendered after a few years of boom. (That recklessness seems to affect a number of wage-earners also, and that is why their bankruptcy rates can go up in a boom.) It is unfortunate that no complete series of "business birth rate" statistics is available, or can be abstracted. Each population census provides such information, but only at five-yearly intervals which are likely to hide the amplitude of fluctuation in the number of businesses at any time. In any case, unfortunately, no Census figures are available for 1931. The Incomes and Income Tax Reports (Department of Statistics) provide additional, though somewhat less accurate information. Because of the lack of such continuous series no close statistical study can be attempted of the connection between bankruptcies and the "business birth rates" in the preceding period. There is plenty of information, however, to put it beyond doubt that, as the boom develops, the rate of establishing new businesses becomes extremely high and, in some cyclically-sensitive industries, the rate is spectacular. There are some incomplete direct statistics for this. The following table throws indirect light on the question. It shows that in two cyclically-sensitive industries, viz. construction and distribution, the labour force has risen since 1947 incomparably faster than in several other industries, and much faster than the total labour force. Since almost invariably the typical establishment in these two industries is very small (and its size does not vary much) the labour force can be taken as indicating a very large rate of growth of business units in the two industries. It is interesting to note that the rise in bankruptcy numbers also started about 1947.

The growth of the number of businesses creates a number of serious problems, and clearly cannot continue forever at top rates. When, at some stage of recovery, a spirit of wild optimism develops, very large numbers of people with floating occupations, probably people most of whom could not make the grade anywhere, invade the

TABLE V

Distribution of Labour Force in New Zealand

Year	Primary	Secondary	Building	Distrib. and Financ.	Total*
		(thousands)			
1947	149·8	171·6	49·3	108·1	703·8
1948	149·4	175·8	51·0	110·9	711·0
1949	148·6	178·0	51·9	112·1	719·4
1950	148·3	182·2	54·1	114·5	731·9
1951	148·1	185·6	53·8	117·8	740·4
1952	148·1	186·3	57·1	120·3	751·9
1953	148·7	187·2	61·6	122·4	767·1
1954	149·2	194·2	66·0	126·9	787·7
1955	150·3	198·8	69·2	130·8	801·2

* The total includes others unspecified in these table groups. Extracted from the N.Z. *Official Year Book* 1956.

cyclically-sensitive trades, setting up businesses of their own with hardly any experience and even less capital. They do not keep any books, their costing is extremely poor, and in any case, for a period they are prepared to continue in business, even if they are making hardly any profit, in the belief that difficulties will somehow miraculously disappear with the passage of time. These people compete with established businesses for scarce capital and materials as well as attracting labour from them. This makes the going harder for sound businesses, and more especially because the "invaders", through bad costing and recklessness, are "able" to undercut. Thus, paradoxically enough, business strains may develop, although investment expenditures and, consequently, total expenditures are high, and although prices keep on rising, though perhaps not so rapidly as production costs.

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PROFIT MARGINS AND WAGE SHARES IN AUSTRALIAN MANUFACTURES, 1945-55

Since World War II, the Australian economy has been through the stages of reconversion from war, inflation, sharp readjustment, a period of stability—and then the beginnings of a second bout of inflation. The years have been marked by a prolonged cost-price spiral, several substantial changes in wages policy, and changing degrees of import competition. In addition, there have been price and capital controls of varying intensity, as well as a substantial rise in the output of manufactured products.

Of this period, one may usefully ask, what was the mechanism of the cost-price spiral? Was it a straight "translation" of cost changes into proportionate price rises? Or, did prices rise at rates different from costs? Did business men try to "ride the market" of inflation? What does the decade show regarding the relative role of demand and cost factors in determining prices in manufacturing industry?

For manufactures as a whole, there are two cost factors which interact. These are the prices of imported and exportable materials and the prices of local labour. During the decade, marked changes in wage rates and hours of work were made by the Arbitration Courts and by Australian governments. In addition, until September 1953, labour costs were directly tied into the wage-price spiral by the system of automatic quarterly cost-of-living adjustments.

One must therefore ask what happened to wage shares in value added by manufacture both during the inflation and in the subsequent adjustment. What can be deduced concerning the role of Arbitration Courts and trade unions in relation to *real* wages and wage shares, as compared with money wage rates? How were the gains of productivity shared between wage earners and gross profit elements? How did rising prices for imported materials impinge on wage shares and on gross margins? The real income of the farm sector was greatly raised by the change in the terms of trade between 1948 and 1951. How did business price policy, union wage pressure, and the Arbitration Court work to effect the redistribution of the higher real income throughout other sectors of the economy?

Both currents of analysis merge in the question—are the prices of manufactured products cost- or demand- determined? From whatever pricing process actually occurs, there comes the "division of the spoils" between wage earner and gross profit elements. Moreover, this same process has a significant effect on the division of the national income between farm and non-farm sectors.

1. *Gross Profit Margins and Wage Shares, 1945-55*

Let us begin by examining data on industrial gross profit margins and on the share of wages in value added by manufacture.[1] The behaviour of g gives an indication of the relation, from year to year, between direct costs of labour and materials and industrial prices. Thus, if g falls, as measured by the aggregate statistics, one may take this to indicate that, on a unit basis, prices have risen less than direct costs, or have fallen more than costs. Similarly, movements in the wage share denote changes in the proportions in which the real output of manufactures is shared between wage earners and the "capitalist" elements included in the gross margin (entrepreneurs and rentiers).

Table I shows the behaviour of percentage gross profit margins and wage shares for Australian manufactures, 1945-55.

From this table we may draw several conclusions regarding gross profit margins.

(i) There has been no trend in g over the decade as a whole.
(ii) There was a tendency for g to decline during the inflationary period, 1947-52.
(iii) g rose significantly in 1952-3, and then remained virtually stable over the three years, 1952-5.

Concerning the wage share, we may conclude:

(i) w showed no trend over the years 1945-53.
(ii) w generally moved inversely with g, in conditions of inflation, recession, and prosperity.
(iii) During 1953-55, the wage share has been some 2 per cent below the levels of 1945-53, chiefly as a result of the rise in the ratio of the materials bill to wages.

If one seeks similar conclusions at the level of the 15 Industrial Classes and the 150 sub-classes, one finds a high degree of support for conclusions (ii) and (iii) regarding both w and g. In terms of the first conclusion—the stability of g and w throughout the relevant periods—one finds that about half the Classes and sub-classes exhibit such lack of

1. The percentage gross profit margin (g) is overheads and net profit before tax expressed as a percentage of value of output. The wage share (w) is the wages bill as a percentage of value added. Wages include payments to all employees other than salaries paid to managerial, technical and clerical staff. Gross profits include pre-tax profits and all overheads, such as salaries, rent, interest, insurance, and depreciation. Together, wages and gross profits constitute value added. Value of output is value added plus the cost of purchasing materials, etc., from other businesses. For Australia, measures of g and w are based on the annual *Bulletin of Secondary Industries* compiled by the Commonwealth Bureau of Census and Statistics. For Australian manufactures in total, in 16 Industrial Classes, and in some 150 sub-classes, the Bulletin gives data on, among other things, the wages bill, materials costs, value added and value of output. The series used in Table I are for all manufacturing Classes, except Class XVI "Heat, Light, and Power". The figures for g are based on the margins for each of the 15 Classes, weighted by their shares in value of output during 1936-9. The wage share figures are similarly based on 1936-9 shares in value added. In fact, the use of weighted series makes no significant difference to the behaviour of g and w from that recorded by series based on current weights; but it does overcome the objection that the behaviour of the series is due to changes in the relative importance of Classes from year to year.

TABLE I

Gross Profit Margins and Wage Shares, Australian Manufactures, 1945-55

Year	g	w	m[2]
1945-6	19·5%	50·0%	2·92
1946-7	19·8	49·3	2·95
1947-8	19·4	49·8	2·92
1948-9	18·8	50·9	2·91
1949-50	19·5	49·7	2·95
1950-1	19·1	49·7	3·06
1951-2	18·2	50·9	3·03
1952-3	19·2	49·8	2·99
1953-4	19·4	48·9	3·07
1954-5	19·3	48·8	3·08

trend. While there is this qualification in terms of (i), the important conclusions regarding the individual series (based on a study of statistics for 60 of the more important Australian manufactures) are that:

(a) at the turning points in economic activity, such as 1951-2 to 1952-3, there is a general movement in gross profit margins in the same direction, and the same is true for wage shares (45/60 cases);
(b) most individual industries record declining profit margins in the inflationary period, 1947-52 (43/60 cases);
(c) many industries have stable gross margins during 1952-5 (40/60 cases);
(d) the inverse movement of wage shares and profit margins is generally apparent, and the lower level of w in 1953-5, as compared with 1945-53, is also widespread (45/60 cases).

2. *Cost- versus Demand-determined Prices*

The purpose of this paper is to relate the figures of Table I to the questions raised in the opening paragraphs. For the behaviour of gross profit margins is of central importance to an analysis of cost-price relations, and of the share of wages in the net output of manufactures. On the basis of data on profit margins, one can examine how changes

2. m is the ratio of the materials bill to the wages bill. Although w and g generally move inversely, the inverse correlation is not perfect because w depends on both g and m. Algebraically, $w = \frac{1-g}{1+gm}$

Thus, if the price of materials rises more than wage rates, and business men maintain stable per cent gross margins, then, other things being equal, the wage share will fall. Hence, the exception to the general inverse movement of w and g (1950-1) is partly explained by the sharp rise of materials prices between 1949-50 and 1950-1. The fall in g, which occurred between those two years, did not therefore have the usual effect of raising w. Again, the fall in w during 1953-4 is not accounted for by a rise in g, but by a substantial rise in the ratio of materials to wage payments, while gross margins remained almost stable.

in direct costs affect prices, and what effect increasing demand (in conditions of full employment) actually has on the size of margins and so on the cost-price relationship.

A. *Theories of Price Determination*

First, however, let us briefly review the behaviour of gross profit margins which one would expect to occur according to theories of perfect competition, imperfect competition, and "full cost" pricing.

Perfect Competition.—Assuming profit maximization, the business man tries to equate marginal cost with price. In almost full employment (that is, most of the post-war period), it is most likely that there will be rising marginal costs so that, as demand and output increase, marginal and average variable costs will diverge more and more. Now, g per unit of output $= \frac{\text{price} - \text{av. variable cost}}{\text{price}}$, and price is equal to marginal cost. So, as demand increases, and marginal cost rises, g $\left(\text{which} = \frac{m.c. - a.v.c.}{m.c.}\right)$ must also rise. In times of reduced demand, the marginal-average variable cost gap will narrow, and g will tend to fall. Hence, in full employment, one would expect conditions of perfect competition to result in demand-based pricing, with rising gross profit margins. A recession, by reducing demand, would tend to result in falling margins.

Imperfect Competition.—There is no clear conclusion regarding the behaviour of g in conditions of imperfect competition. For the level of margins will depend, assuming profit maximization, on how elasticity of demand changes as shifts in the demand curve occur. If one assumes, as with Chamberlin and Kalecki, iso-elastic movements of the demand curve, and if firms operate with constant marginal costs (so that $m.c. = a.v.c.$), then g will be stable as demand rises and falls. This holds because g is the reciprocal of elasticity of demand, provided profits are maximized.

If one assumes changes in elasticity, then g changes inversely, provided still that marginal costs are constant and profits are being maximized.

In full employment, it is probable that business men will find demand less elastic, as the result of reduced competition and higher demand. Assuming constant marginal costs, one would also expect rising gross margins. If one assumes rising marginal costs, then, as in the case of perfect competition, g would be even more likely to rise. The reverse line of argument would hold for a recession.

Full Cost.—There are many varieties of "full cost" theory; but the gist is that business men price products by adding a conventional percentage mark-up to direct costs. So long as this percentage remains stable, the conclusion of the theory is that prices are cost-determined. Demand factors may be reflected in changes in output and in the proportion of g paid out to overhead factors. If one takes into account

rising marginal costs in periods of boom, then, as with other theories, one would expect the divergence between marginal and average variable costs to lead to rising g, only if business men were maximizing profits. If, by definition, those who use "full cost" pricing are assumed to waive maximum profits, there is no reason why the conventional percentage mark-up on direct costs should increase.

Most explanations of "full cost" pricing embrace circumstances in which margins may be varied from conventional levels. They may rise in depression when restrictive agreements prevent prices from falling in proportion to direct costs, and when unit overheads increase. They may rise in times of boom and "bottleneck" if business men do come to seek maximum profits. In the most flexible of "full cost" theories, the margin is seen as a competitive weapon, and business policy is carried out in part by changing its level. Thus, competition may lower the margin when imports increase or when unit overheads fall with increased output. So, "full cost" theory ranges from definitional stability of percentage gross margins to an explanation of the circumstances in which g may vary.

In short, under both perfect and imperfect competition theories, prices are demand-based, and business men tend to receive rising gross margins in times of high employment. "Full cost" theories assume relatively stable margins and cost-determined pricing; but, many circumstances may be adduced in which the gross margin may vary.

Hence, if the prices of manufactured products, 1945-55, were demand-determined, one would, at first sight, expect rising margins in the inflationary period, 1947-52. This conclusion would be strengthened by the effects of full employment in restricting competition from new firms, from new capacity, and at times from business abroad. For much of the period, there was every inducement for business men to "ride the market" by raising g. Certainly, one would expect such a result if business men based pricing policy on maximizing profits. The year 1952-53 saw a sharp change in business conditions, with increased stocks and imports, some unemployment, and the return of a buyer's market in many industries. One would therefore expect gross margins to fall as the pressure of demand lessened relative to supplies available. In the more stable conditions of 1953-5, with the level of vacancies and the stability of prices indicating absence of inflationary pressure, one might look for a recovery of margins from 1952-3 levels.

On the other hand, the thesis that prices are cost-determined entails movements of price in proportion to changes in the direct costs of labour and materials. This implies that business men do not alter gross margins in order to make the maximum profit possible from the level of demand. Rather, they benefit from lower overheads and higher net profit margins per unit of output. Accordingly, the inflationary period after the war would be marked by stable percentage gross margins. If one adopts the flexible ("competitive") view of "full cost" pricing, and takes into account the lower burden of overheads per unit and the increased import competition, one might even expect

falling margins. The reverse situation would be expected in 1952-3, and so a case might be made for rising gross margins. For the more stable period of 1953-5 one would expect fairly stable margins, in accord with the assumed practice of relating costs and prices by adding a conventional percentage mark-up to direct costs.

Which picture is the more accurate description of 1945-55? Certainly, the series for g in Table I gives more *a priori* support to the theory of cost-determined pricing. For realized margins fell during the inflation, rose in the 1952-3 recession, and subsequently remained stable. But the mere juxtaposition of Table I and the theoretical descriptions given above is misleading. We have not taken into account the effects of what may be called "leads" and "lags", nor of the greatly increased capacity to produce manufactures which became effective in the latter part of the decade.

By "lags", we mean the lag of manufactured prices behind rising costs during the inflationary period, 1949-52. In so far as rapid cost rises occur through business men paying over-award and overtime wages, we may expect them to adjust their prices promptly, or even in advance. But much of the cost rise in Australia stemmed from the rapidly rising prices paid for imported materials used in manufactures and for materials which found their major markets abroad. This cost rise tended to squeeze profit margins in the boom years. The squeeze on w and g exercised by rising costs may, therefore, be consistent with demand- or cost-based pricing. For, in either case, there may be a price lag and pressure on margins. But whereas increased money wages become increased demand, so that cost rises can be passed on, increased payments abroad do not raise domestic demand. Unfortunately, however, there is no clear means of deciding how far the rapid cost rise of 1950-2 was due to rising wage and domestic materials costs, and how far to the increase in the cost of imported materials. But, so far as the cost increase was due to the import factor, the squeeze on margins, in a time of such high levels of demand, is compatible with demand-based pricing.

By the term "leads", we have in mind chiefly the effects of anticipations regarding import restrictions on the behaviour of business men. Varying intensity of competition from imports must be seen not only in terms of actual imports, but also in terms of expected changes in the rate of imports. In part, it is true that the effect of imports on profit margins is borne out in Table II; but we have also to look at business expectations regarding the level of imports. That business men and government officials do make such estimates is reflected in the semi-annual *Survey of Manufactures* issued by the Department of Trade. It is particularly clear in the issues of October, 1953, and April, 1954. Such behaviour must surely be expected to affect price policy, and must therefore be taken into account in interpreting movements in profit margins as given in Table I.

Finally, it must be recalled that the theoretical analysis given above does not allow for increased manufacturing capacity. In fact,

TABLE II

Wages, Prices, Output and Employment, 1945-55

Year	Wages (1945–6 = 100)			Prices (1945–6 = 100)			Gross Profit-Margin g	Wage Share w	Output (1945–6 = 100)		Employment and Unemployment			
	Nominal Wage Rates (1)	Average Weekly Earnings (2)	(2)/(1) (3)	'C' series (4)	'C' series ex. Rent (5)	Basic Materials (6)	(7)	(8)	Total Output (9)	Output per man-year (10)	Employment 1945–6 = 100 (11)	Vacancies '000s (12)	Registered Unemployed '000s (13)	No. on benefit '000s (14)
1945–46 ..	100	100	100	100	100	100	19·5%	50·0%	100	100	100	n.a.	n.a.	n.a.
1946–47 ..	105	106	101	102	103	100	19·8	49·3	112	104	108	60	34	9·4
1947–48 ..	117	121	103	109	111	111	19·4	49·8	121	106	114	90	18	3·9
1948–49 ..	130	136	105	120	124	126	18·8	50·9	128	108	119	108	14	1·6
1949–50 ..	140	150	107	131	138	144	19·5	49·7	133	108	123	99	15	10·3
1950–51 ..	166	181	109	149	161	177	19·1	49·7	149	115	130	117	10	0·8
1951–52 ..	202	221	109	183	202	215	18·2	50·9	153	117	131	91	20	2·7
1952–53 ..	225	239	106	200	221	235	19·2	49·8	145	116	125	22	61	30·0
1953–54 ..	231	251	109	205	226	223	19·4	48·9	172	129	133	38	33	13·2
1954–55 ..	235	266	113	207	227	222	19·3	48·8	183	133	138	60	19	3·7

(1) Cols. (1) and (2) are for adult males in manufacturing industry (1) from Tariff Board *Annual Report*, June 1956; (2) from *Commonwealth Bank Bulletin*.
(2) Cols. (4) and (6) are from *Quarterly Summary of Australian Statistics*.
(3) Col. (9) is composed of A.N.Z. Bank series of factory output 1948–9 to 1954–55 and Stevens' series 1945–49, as given in *Economic Record*, May, 1954.
(4) Col. (10) is Col. (9) divided by Col. (11).
(5) Col. (11) is *Production Bulletin* series for average number employed in factories during the year.
(6) Cols. (12)–(14) are from statistics provided by the Department of Labour and National Service.

we have to take into account the effects of increased investment on capacity and on the intensity of competition. In particular, this holds for the introduction of new capacity during 1953-5, when post-war investment plans were coming to fruition.

B. *Factors Affecting Profit Margins in Manufactures*

Let us now turn to examine the role of several factors which affected the behaviour of profit margins during 1945-55. Each will be found to have some bearing on the relative role of cost and demand elements in determining prices and cost-price relations.

(a) *Price Control and Profit Margins*

One may expect price control to prevent business men from raising gross margins in response to the pressure of demand. In this way, one might account for the stability of margins during 1945-8. But the behaviour of margins after 1948 does not yield any pattern which one might expect of the State-operated controls which replaced Commonwealth control in 1948 and which continued, with decreasing effectiveness, for several years. Certainly the upward movement of 1948-50, in both gross and net margins, is hard to reconcile with effective price control. Moreover, the stability of gross margins in 1945-8 is no more marked than that of 1952-5, when price control was negligible. In fact, there would seem to be no certain way of assessing the effect of price control on gross profit margins.

(b) *Profit Margins and Stocks*

If profit margins do reflect the influence of demand factors, one would expect changes in stocks to have a significant influence on margins. Thus an increase in stocks, relative to turnover, may be expected to have a depressive effect on profit margins. The actual course of a stock/turnover ratio will, in Australia, reflect import competition and controls, as well as local competition.

In the following table, an attempt is made to compare stocks and turnover for Australian manufactures as a whole.

Clearly, on a year to year basis, Table III does not always reveal an inverse movement in g and the stock/turnover ratio. But it may be argued that this is not the main point of the table. In view of the price-fixing process, the role of leads and lags, and the way in which the stock ratios are calculated, one may not expect an inverse relationship on an annual basis. What is quite clear, however, is the inverse *trend* of the series in Table III. That is, during 1947-52, there is a clear fall in profit margins and, likewise, a marked rise in the stock/turnover ratio. Conversely, during 1952-4, the level of g is much higher than in 1951-2 while, after the turning point in 1952-3, the stock/turnover ratio is at much lower levels. Thus, by 1953-4, after substantial inverse movements, both the ratio and gross profit margins were back at their pre-1950 levels.

TABLE III

Stock/Turnover Ratio for Australian Manufactures, 1945-54[3]

Year	Gross Margin %	Δ	Turnover (£ mill.)	Stocks (£ mill.) 'Survey'	Stocks (£ mill.) 'Tax'	Stock/Turnover Ratios 'Survey' Ratio	'Survey' Δ	'Tax' Ratio	'Tax' Δ
1945-46	19·5	..	842	..	115	..	..	·137	..
1946-47..	19·8	+	984	239	133	·245	..	·135	−
1947-48..	19·4	−	1,179	291	170	·250	+	·144	+
1948-49..	18·8	−	1,387	354	214	·255	+	·154	+
1949-50..	19·5	+	1,603	416	256	·260	+	·160	+
1950-51..	19·1	−	2,097	523	323	·250	−	·154	−
1951-52..	18·2	−	2,562	698	433	·275	+	·169	+
1952-53..	19·2	+	2,634	762	480	·290	+	·182	+
1953-54..	19·4	+	3,000	735	482	·245	−	·161	−

(c) *The Degree of Import Competition*

The level of the stock/turnover ratio in 1953-4, as compared with 1951-3, is partly related to a third factor which affects pricing and profit margins. This is the level of imports. It is well known that much of the competition in Australian manufactures comes from imported goods. Indeed, the mere anticipation by business men of changes in the rate of flow of imports affects their prices and margins.

The influx of imports in 1951-2, which does much to explain the rise in the stock/turnover ratio during 1951-3, would partly account for the fall in gross and net profit margins in 1951-2. Then, the imposition of severe import restrictions in 1952 reduced supplies, and business men therefore anticipated less competition for market demand. One would therefore expect import restrictions to lead to rising gross margins in 1952-3, and this rise did in fact occur. Thereafter, expectations of changes in government licensing policy seem to have had a marked effect on price policy in many industries. During 1953-5, the anticipation of more generous supplies of imports exercised a restraining effect on prices and margins in a time of rising demand and restricted imports. Business men might have been expected to raise margins within the protection accorded by current import policy. That they did not do so is due, in part, to the anticipated (and realized) easing of import restrictions.

3. For Turnover, the *Production Bulletin* series of Value of Output is taken as an approximation. For Stocks, the measures are:

"Survey": from *Quarterly Business Survey* figures of manufacturers' stocks at balance date in year ending September 30, 1946, etc. Then, figures for Sept., 1946, and Sept., 1947, are averaged to give figure for 1946-7, and so on.

"Tax": from Taxation Commissioner's *Annual Reports*. These give opening and closing stocks, July 1, 1947-June 30, 1948, etc., for manufacturing companies. The opening and closing figures are averaged to give the above series. First, however, one has to overcome the difficulty that the tax series shows opening stocks for one year different from closing stocks of the previous year. This is overcome by taking the closing stock of each year as the opening stock of the next, and then adding the absolute increase in stocks during the year to the adjusted figure for opening stocks.

The *Survey of Manufactures*, October 1954, gives the following information on the rate of flow of imports into Australia.

	October 1952	April 1953	October 1953	April 1954	October 1954
Average monthly imports in previous 6 months (£m.) ..	51	41	49	56	68
Percentage change in above series from 6 months previously	—45%	—19%	+19%	+14%	+22%
Percentage change in factory employment from 6 months previously	—4%	+2·7%	+2·4%	+2·7%	+1·1%

The *Survey* cites these figures as evidence that imports were rising faster than domestic factory production during 1953-4. Such figures reflect the widespread impact of anticipated import competition on manufacturing and other business. It is quite clear from the *Survey* that there was, in 1953-4, widespread concern at the prospect of keen competition from imports during 1954-5. By 1953-4, then, actual and prospective imports were exercising a restraining influence on gross profit margins.

In terms of individual industries, one might expect the flood of imports to have reduced gross margins in import-competing industries during 1951-2. Of the 60 industries studied, the only one with both substantial import competition and *rising* margins was cotton milling. Even then, margins were below the 1945-50 level. On the other hand, there were falling gross margins in such import-competing industries as motor vehicles, woollens, hosiery, rayon, sawmills, electrical equipment, plant and machinery, bags and sacks, paper products, and wire working. Similarly, one would expect rising profit margins in 1952-3, with the onset of severe import restrictions. Again, this was true of most import-competing industries, the exceptions being sawmills, motor bodies and wire working.

(d) *The Rate of Change in Direct Costs*

Another element which helps explain the pattern of realized gross profit margins is the rate of change in direct costs as compared with changes in price.

The rates of change in import prices (including materials used in manufactures) and in the prices of basic materials are shown in the following table, along with the change in wages as measured by average weekly earnings. In addition, value added per unit of output is taken as an approximation to the prices of manufactured products, there being no official index available.

As we have already seen, the lag of prices behind costs during the inflation of 1950-2 is *a priori* consistent with either cost- or demand-based pricing. This period covered the sharpest rises in costs, domestic and imported, and the lowest levels of gross margins for the post-war decade. So far as the squeeze on margins follows from a lag in the pricing process while domestic wage costs are rising rapidly, one may regard the behaviour of margins, 1950-2, as consistent with cost-plus

TABLE IV

Rates of Change in Prices and Costs, 1949-55

(percentage change from previous year)

Year	Import Prices[4]	Basic Materials Prices	Average Weekly Earnings	'C' Series exc. rent	Unit Direct Costs	Value Added per Unit	g	w	Output
1949-50	+4	+14	+10	+11	+10	+14	+3·7	−2·4	+ 4
1950-51	+17	+23	+20	+17	+17	+14	−2·1	0·0	+12
1951-52	+21	+21	+22	+25	+20	+17	−4·7	+2·4	+ 3
1952-53	− 5	+ 9	+ 8	+ 9	+ 7	+11	+5·5	−2·2	− 5
1953-54	− 3	− 5	+ 5	+ 2	− 4	− 4	+1·0	−1·8	+19
1954-55	+<1	−<1	+ 6	+<1	+ 4	+ 4	−<1	−<1	+ 6

pricing. To the extent that the squeeze follows from the rise in the cost of imported materials used in manufactures, one may take the pattern of realized gross margins to support demand-based pricing.

5. *Conditions of Supply in Manufactures*

Changes in the conditions of supply have had an important influence on the levels of costs and prices in manufactures. Yet both gross margins and wage shares remained relatively invariant while marked changes occurred in the various factors which affected the supply of manufactured products. Some important aspects of supply must now be considered.

The Labour Market.—There was a marked shortage of labour in 1949-51, as can be inferred from the ratio of average earnings to nominal rates and from the employment data given in Table II. The price of this labour was, in a sense, demand-determined; for business men paid over-award and overtime wages in the knowledge that they could pass on rising labour costs. Thus, the pressure of demand led to wage rises which were matched by rises in price. Despite this strong demand for labour, the wage share rose, and the profit margin fell, but slightly. And this move is to be explained more in terms of rising import costs. Again, in the increasing labour shortage of 1954-5, prices and direct costs kept in line, and the wage share did not rise.

The figures in Table II also show two sharp rises in man-year output, in 1950-1 and 1953-4. In the latter year, the increase in productivity was accompanied by a smaller rise in wage and materials costs than in 1950-1, and so unit wage and unit materials costs actually fell. The behaviour of gross margins in 1953-4 would indicate that prices were reduced proportionately to the fall in labour and materials costs. The benefits of increased productivity were therefore passed on to buyers. Part of the explanation of this parallel movement in prices and costs would seem to lie in the effects of other supply elements now to be discussed, namely, imports and industrial capacity, for they provided a strong competitive impetus for business men to pass on cost economies.

4. Import price series is from unpublished work by H. P. Brown. Food, Drink and Tobacco, and Fuels and Lubricants are excluded.

The Supply of Imported Materials and Manufactures.—It is clear from stock/turnover ratios and materials price indices that the Australian market is sensitive to changes in the supply and price of imports. As we have seen, an increased supply of manufactured imports may be expected to reduce or help stabilize profit margins, while a rise in the price of imported materials may squeeze profit margins—and also wage shares, unless wage rates keep pace. Imported supplies have therefore significantly affected the pricing of manufactured products and the distribution of value added between the factors of production.

Capacity.—Throughout the post-war period, a high proportion of gross national product was devoted to increasing capacity to produce manufactures. Many investment plans came to fruition in and after 1952, when labour was in easier supply, prices were stable, and imports were restricted. The year 1953-4 was one in which capacity and labour productivity increased substantially. The net effect was increased competition, and so prices fell in many manufacturing industries. This is borne out in the *Surveys of Manufactures,* in *Production Bulletin* statistics of volume and value, and in Column 7 of Table IV. Thus, increased capacity had a restraining effect on profit margins in a period of rising demand and import restrictions, when otherwise there would have been inducements to raise margins.

Competition.—Changes in the degree of competition affected price levels and the relation of costs to prices in Australian manufactures. On the supply side, the factors which made for increased competition were increased imports, and increased capacity and productivity within Australian industry. Throughout 1950-5, one sees these competitive elements at work. In 1950-2, there was competition from greatly expanded imports. Again, the threat of increased imports affected business price behaviour in 1954. Greater capacity and productivity intensified competition in many industries in 1953-5. Thus, factors making for greater supply and more competition in manufactures have had a restraining effect on profit margins, especially in the two periods of high demand, 1950-2 and 1953-5.

6. *Net Profit Margins*

Further evidence on whether business men "rode the market" during the inflationary period comes from the study of net profit margins on shareholders' funds earned by Australian manufacturing companies. These series are given in Table V.

In the light of previous analysis and the data in Table V, there are two conclusions which are relevant to a discussion of cost-price relations.

(i) Even in the years of maximum pressure of demand and of relaxed price controls, 1949-52, the net margin on shareholders' funds was only some 1 per cent above the 1938-9 level. This was so despite

TABLE V

Gross and Net Profit Margins, Manufacturing Companies, 1938-9, 1945-55[5]

Year (1)	g (2)	% Net Profit on s/h Funds (Cth. Bank) (3)	% Net Profit on s/h Funds (Fin. Review) (4)	Adjusted % Net Profit on s/h Funds (5)
1938-39 ..	21·3	8·5	..	..
1945-46 ..	19·5	..	..	..
1946-47 ..	19·8	7·7	..	7·7
1947-48 ..	19·4	8·1	..	8·1
1948-49 ..	18·8	7·6	..	7·6
1949-50 ..	19·5	8·8	..	8·8
1950-51 ..	19·1	9·0	..	10·6*
1951-52 ..	18·2	7·9	8·3	9·3*
1952-53 ..	19·2	8·9	8·8	8·9
1953-54 ..	19·4	10·4	10·8	10·4
1954-55 ..	19·3	10·5	10·7	10·5

greater scope for capitalizing on demand and on the shortage of goods as reflected in waiting lists.

(ii) One may note that the two periods of high yield, 1950-2 and 1953-5, were years when output was notably above previous years. Thus, 1950-2 output was 14 per cent above 1949-50, and 1953-4 output was 22 per cent above 1952-3. This would seem to indicate that the spreading of overheads over substantially larger output leads to a higher "net" element in the gross margin per unit of sales. What figures are available support the view that a widening of net margins on turnover did occur in both periods. Moreover, many overhead costs are inflexible, as compared with direct costs, in times of rising wages and prices. The outcome is an increase in net margins on shareholders' funds. Thus, high *net* margins on sales and on funds employed occurred along with *falling* gross margins during 1950-2. That the same pattern of falling gross margins does not recur in 1953-5 is probably due, in part, to import restrictions.

If import competition had been allowed full play in 1953-5, it is probable that gross profit margins would have fallen again, and net margins might not have risen so high. But, within the protected market, business men, for reasons we have reviewed, did not succeed in *raising* margins. In fact, the stability of margins shows that the increased productivity (lower real unit direct costs) of 1953-4 was passed along to consumers, and the existing cost-price relation accordingly preserved. Increased demand led to higher over-award wages, the ratio to nominal rates reaching a post-war peak in 1954-5. Prices

5. Columns (3) and (4) show profit rates after tax provisions, and are taken from the *Commonwealth Bank Bulletin* and the *Financial Review* of the *Sydney Morning Herald*. Column (5) is Column (3) adjusted for the higher tax rates of 1950-52, when company tax was 9/– in £1, as compared with the subsequent and previous rate of 7/–. Hence, rates of profit for 1950-52 have been raised 18%. Company accounts closing in any month of a calendar year are included in the series for the year ending June 30 of that year.

then rose proportionately with unit direct costs, but no higher. While gross margins did not rise, the absence of a fall may be taken as a form of "riding the market" in conditions of high demand and lessened import competition. Economies in unit overhead costs were not passed on to buyers as were those in the use of direct labour and materials. Thus, the record of net and gross profit margins, as given in Table V, shows that the increased percentage returns on shareholders' funds, 1950-2 and 1953-5, have been due not to widening gross margins, but to a rise in the "net" element in the gross margin on turnover.

C. *An Assessment*

There is, then, substantial evidence that manufacturers do base their prices and profit margins on what the market will bear. The most important single sign of this is the inverse correlation between the stock/turnover ratio and changes in the percentage gross profit margin. Secondly, one may cite the marked effect on g of changes in imported supplies, including the effect of anticipated changes in import quotas. For example, the failure of g to rise with demand and import restrictions in 1953-4 follows in part from an anticipated increase in imports, as well as from increased capacity in many industries. Moreover, the lag of prices behind rising costs in the peak years of inflation, with the consequent fall in gross margins, may be consistent with demand-based pricing. This is true so far as the lag is due to the rising cost of imported materials. Finally, as we have just seen, the higher net margins of 1953-5 may be regarded as the result of one form of "riding the market".

On the other hand, the behaviour of the gross profit series does give *a priori* support to cost-plus pricing theory. There is no marked rise in g in the years of boom. Indeed, the lag of prices behind costs in 1950-2 may be taken to support this contention. For, so far as the squeeze of profit margins is the result of the faster rise of domestic costs than prices, the lag may be taken to represent an institutional lag in price fixing. Again, the stability of g since 1952, when effective demand was increasing substantially, may also be advanced in support of cost-plus pricing. Finally, the declining effectiveness of price control was not followed by rising profit margins, despite the higher levels of demand.

The balance of evidence would seem to lie in favour of demand-based pricing. For, as has been shown above, there are many "demand-type" factors which may account for the apparent high degree of stability in realized gross margins. The forces of demand, supply, and competition, would appear to outweigh any explanation in terms of adherence to a conventional cost-plus procedure. That the inflationary period produced falling rather than rising margins may be accounted for by such market factors as stock rises, import competition, and the rising price of imported materials. That margins have remained stable over the three years, 1952-5, is the result of the operation of such

market factors as the introduction of greater productive capacity and the anticipation of increased supplies of imports.

There is, however, no evidence that business men successfully "rode the market", in the sense of widening gross margins during the years of high demand. That this "riding" did not occur would seem to be the result not of widespread cost-based pricing, but of the operation of various supply and demand factors which determined the pattern of prices and profit margins in manufactures, and resulted in parallel movements in unit direct costs and in prices.

3. *The Wage Share in Value Added*

Whatever conclusion one may reach concerning cost- versus demand-determined prices, let us now follow our analysis of pricing with a discussion of wage shares in manufactures. The pricing process and the distribution of value added between wage and non-wage incomes are closely related. Indeed, one of the most important results of the pricing process is the determination of the wage share. For wages and gross profits comprise value added. Thus, the fixing of the profit margin at a certain percentage determines, other things being equal, the proportion of value added received by wage earners. As has been shown in the note to Table I, changes in w stem largely from changes in g, and also from changes in m, the ratio of the materials bill to the wages bill of manufacturing industry.[6]

The wage share shows the proportion of the net output of industry accruing to wage earners, a proportion which it is union policy to try to increase. Its year-by-year behaviour will record the working of such factors as Arbitration Court judgments, productivity increases, union efforts at squeezing profits, business price policy, and changes in the price of imported materials.

A. *Stability of the Wage Share*

The significant ratio on which our analysis is based is the share of wages in value added by manufacture as given in Table I. From this table it would seem clear that w remains fairly stable during the decade, and that it moves inversely to the gross profit margin. In terms of each £1 of value added, the wage share fluctuates between the narrow limits of 9s. 9d. and 10s. 2d. Yet, throughout the period, there were substantial changes in money wage rates. These have occurred partly through cost-of-living adjustments, and partly through other Court decisions on wage rates. On the first count alone, the basic wage would

6. Direct costs are composed of labour and materials costs. The cost of materials can be resolved into the labour and gross profit elements of other industries, and so the two basic interacting factors which comprise direct costs are labour costs and the cost of imported materials. Hence, m is the product of the ratio

$$\frac{\text{price of imported materials}}{\text{Australian wage levels}}$$

and the input of imported materials per unit of labour. It can be seen that depreciation would lower w as it raises m, while economies of input of materials would lower m, and so allow w to rise. I am indebted to Professor P. H. Karmel for this formulation.

have risen 100 per cent between 1945-6 and 1952-53. Nominal wage rates also included rises stemming from the 1946 basic wage rise, the 1947 margins case, the December 1950 £1 increase, and the May 1954 margins award. Between 1945-6 and 1952-3, nominal wages rose 125 per cent, as compared with the rise of 100 per cent in the "C" series. When one also includes over-award and overtime payments, it is found that average weekly earnings rose 140 per cent in the same period. As is shown in Table VI, real wages rose by 20 per cent, and productivity (in the sense of output per man-year) by 16 per cent. But these marked rises in money wage rates and in real and money earnings are not reflected in any appreciable change in the wage share between 1945-6 and 1952-3. This is just another way of saying that prices and direct costs moved proportionately.

This same statement holds for 1953-5 as for earlier years, even though cost-of-living adjustments were not granted by federal or by some state authorities.[7] The "wage freeze" period was marked by an increase of average earnings relative to nominal rates to a level much higher than in 1950-2. The increase in weekly earnings by 11 per cent, while the "C" series rose 3 per cent, indicates the pressure of demand upon costs, while the stability of gross margins shows that business men passed on their higher costs.

One may expect both employers and employees to try and secure a greater share of value added. One may look to Governments and Courts to adopt policies which affect income distribution between the factors of production. But within the manufacturing sector, no such attempts have borne fruit in changed wage-gross profit shares in value added. Thus, a Court may grant a wage increase, or business men make substantial over-award and overtime payments; but neither action has an enduring effect in the form of increased wage shares. This merely indicates that manufacturers *do* recoup themselves for wage rises by adjusting prices proportionately.

In short, there is no record in the post-war period of redistribution of manufacturing income by functional shares being achieved through changes in wage rates and weekly earnings. Rather, one must look at manufacturers and workers as a group *vis-a-vis* the rest of the community, notably in opposition to the farmer. This factory-farm contest is discussed in Section IV.

While much of 1945-55 has been marked by high levels of demand and by inflation, there have also been years of large increases in output and productivity (output per man-year). In Table VI, we give several series related to the question at issue—how are the gains of increased output and productivity shared between gross profit elements, workers, and consumers?

It would appear from Column (4) of the table that output per man-year increased some 33 per cent over the decade. Hence, unit wage costs (7) rose some 107 per cent, as compared with a rise in average

7. We may recall that the apparent fall of 2 per cent in w, as compared with 1945-53 levels, is due to the sharp rise in m, and not to higher gross margins.

TABLE VI

Production, Productivity, and Costs, Australian Manufacturers, 1945-55

Year	Employment	Output		Weekly Earnings		Unit Wage Costs	Unit Gross Margins	w	ε	Unit Direct Costs	Value per Unit
		Total	Man-Year	'Real'	Money						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1945–46 ..	100	100	100	100	100	100	100	100	100	100	100
1946–47 ..	108	112	104	104	106	104	106	99	102	104	104
1947–48 ..	114	121	106	110	121	116	116	100	99	116	116
1948–49 ..	119	128	108	113	137	130	125	102	96	130	129
1949–50 ..	123	133	108	115	151	142	145	99	100	143	143
1950–51 ..	130	149	115	121	181	162	165	99	98	168	167
1951–52 ..	131	153	117	121	221	196	190	102	93	201	199
1952–53 ..	125	145	116	120	239	212	216	99	98	216	216
1953–54 ..	133	172	129	122	251	199	209	98	99	207	207
1954–55 ..	138	183	133	129	266	207	219	98	99	215	216

Note: Column (5) is Column (6) divided by 'C' Series of Prices.
Column (7) is derived from an index of Total Wages Costs divided by the index of Output in Column (3).
Column (8) is derived from an index of Gross Margins divided by the index of Output in Column (3).
Column (11) is derived from an index of Direct Costs divided by the index of Output in Column (3).
Column (12) is derived from an index of Value of Output divided by the index of Output in Column (3).

weekly earnings (6) of 166 per cent. This means that "real" direct costs fell over the period. In 1953-4, unit wage costs even fell in money terms; for the percentage rise in output per man was greater than the increase in weekly earnings. It is therefore clear that real savings in inputs of labour were achieved. Yet Columns (7) and (12) show a parallel movement between unit wage costs and value per unit. One may conclude that the worker received a substantial share of the increased output from higher productivity. Otherwise, the cost-price margin measured by (7) and (12) would have widened appreciably. The fact that unit direct costs have moved in proportion to unit prices also shows that economies in the use of direct factors of production have been passed to consumers.

If the manufacturer were to attempt to secure the full benefits of increased productivity for gross profit elements, then the cost-price gap would increase. That this does not occur indicates that the suppliers of the direct factors of production share in the new output in the same proportion as they shared in the total output before productivity increased. Thus the stability of the wage share means that wage earners secure the same proportion of the new output as they did of the pre-existing output. A rough indication of this is found in the rise of 29 per cent in real wages and of 33 per cent in output per man-year between 1945-6 and 1954-5, as shown in Table VI.

Similarly, the gain to consumers from increased productivity is seen in the fact that, throughout the decade, price flexibility has been such that "real" prices are reduced in proportion to declines in "real" costs. This is reflected in the stable relationship between the series for unit direct costs and unit value. The consumer, like the worker, has not found the manufacturer securing wider gross profit margins and keeping the gains from increased productivity to himself. What extra gain does occur to the business man (as against the rentier element in gross profits) stems from the spreading of overheads when production increases as a result of fuller use of capacity or higher productivity. The paid-out costs included in the gross margin decline per unit of output, and so rising returns on shareholders' funds are possible, even while g and w are stable. Thus, the gains from increased productivity undergo a three-way split between manufacturer, worker, and consumer.

B. *The Role of the Arbitration Court and Trade Unions*

It is only to be expected that such an analysis of pricing and of wage shares in manufactures should lead to some consideration of the role and effectiveness of such institutions as the Arbitration Court and trade unions, and of such practices as cost-of-living adjustments.

One may say that the role of the Court has been:

(a) to help raise wages in industries which might otherwise pay rates below a socially acceptable minimum, or which do not have strong unions;

(b) to protect real wages from rises in the cost of living; and
(c) to ensure that real wages increase with "capacity to pay".

In the last two functions, one must distinguish between action designed to protect or help the worker in his own manufacturing industry, and action related to his position *vis-a-vis* the non-manufacturing sectors of the economy.

In terms of role (b), two important conclusions emerge from post-war experience. In the first place, we have already seen (note to Table I) that rising prices for materials used in manufactures will squeeze the wage share, unless wage rates rise correspondingly, or profit margins are cut. It is clear that the Court practice of raising money wage rates, by cost-of-living and other awards, has helped prevent the wage share, and real wages, from being squeezed by the rising prices of materials. This is most apparent in 1950-2. Secondly, one may conclude that cost-of-living adjustments do not squeeze profit margins (or even raise real wages) since the increased wage costs are passed on to buyers. We may go further and say that, in full employment, absence of cost-of-living awards need not harm the worker, in the sense of reducing real wages or lowering w by allowing g to rise; for the high level of demand leads to an increased ratio of actual earnings to nominal rates. Post-war experience shows that this process maintains w and raises real wages in rough accord with productivity. If, in addition to passing on cost rises, business men were to "ride the market", one might conclude differently.

It remains true, however, that higher demand generally leads to larger real and money turnover, so that stable percentage gross margins yield higher net margins on funds employed, as in 1950-1 and 1953-5. It is in such circumstances that the Court exercises its third function—that of raising money wage rates in the light of increased "capacity to pay". This was most recently done in May 1956, May 1954, and December 1950.

The year 1950 was one in which "capacity to pay" had, by various measures, increased substantially. In fact, 1950-1 showed peak profits on funds, and was the year with the highest increase in output and man-year production since the war. Accordingly, the Arbitration Court raised the basic wage by £1 per week in December 1950. What effect did this decision have on wage shares and on gross margins? It may account, in part, for the fall in margins during 1950-2, and the consequent rise in wage shares. But if this was the intention of the Court, we may well point to the transiency of the change. For, within two years of the decision, profit margins were restored and wage shares had fallen from their 1951-2 peak. Indeed, one may conclude that, save possibly by exposing manufacturers to greater import competition, rising money wage rates will not result in increased wage shares. "Real" wage rises as given by the Court do not appear to have a lasting effect on the wage share in manufactures.

In the prosperous conditions of 1955-6, the Court made a further increase in award rates because "capacity to pay" had increased. In

this case, as compared with 1950, the increased "capacity" clearly did not originate in the farm sector, but in the manufacturing sector itself, where it was shown by high returns on shareholders' funds. If the Court were acting on the belief that wage shares could be increased by raising money wage rates, past experience would indicate that this is not so—especially when manufacturers are so protected from import competition. It would therefore seem that the Court was more concerned with the effects of the 1953 cost-of-living "freeze" on relations between state and federal awards, and with the widening gap between actual earnings and nominal wage rates.

At this point it is appropriate to contrast movements in wage shares in the United States under a system of collective bargaining with the course of wage shares in Australian manufactures under a system of arbitration and basic wages. Table VII shows that, without cost-of-living adustments or action by a Court, the same lack of trend in wage shares is apparent in U.S. manufactures as in Australian.

TABLE VII

Index of Wage Shares, Australian and U.S. Manufactures, 1947-54[8]

Year	United States (1947 = 100)	Year	Australia (1947-8 = 100)
1947	100	1947-8	100
1949	99	1949-50	99
1950	95	1950-1	99
1951	98	1951-2	102
1952	99	1952-3	99
1953	99	1953-4	98

To some extent union policy is cast in terms of trying to increase the wage share in manufactures. This is one part of the unions' effort to secure a larger share of national income for the worker. But the figures given in this paper support the proposition that it is difficult to increase the wage share in value added by altering money wage rates, whether through arbitration or collective bargaining. A wage rise tends to result in a price rise, which leaves the wage share unchanged. Union efforts for higher money wages may help preserve wage shares against increasing monopoly power and against rising prices of materials used in manufactures. Wage shares may be greater than those which would be received by unorganized labour. But, the union policy of altering income distribution is more readily effected through fiscal policy (tax rates and social services), and through recognizing a common interest with employers in increasing the share of manufactures in real national

8. U.S. figures are based on *Annual Survey of Manufactures*, 1954. We may also cite the findings of a recent Report of the Joint Economic Committee of the U.S. Congress: "The shares of total income (in current dollars before tax) going to labor and to total non-labor categories probably have remained about the same (p. 10) . . . (in) the manufacturing sector, unit labor costs seem to move in line with unit value added; (p. 55)" *Productivity, Prices, and Incomes*, June, 1957.

income at the expense of fixed incomes and of the exporter of primary products. To these broader wage issues we now turn.

4. *Manufactures in an Open Economy*

Especially in an open economy, one must consider the relationship between the other sectors of the economy and the price policy and wage rates operative in manufactures. In particular, we are concerned with the interaction between changes in farm prices and incomes and the wage-price-arbitration mechanism which we have been examining.

A. *Sharing the Gains of Improved Terms of Trade*

A high level of investment and a sharp increase in export incomes combined to create inflationary conditions in Australia, notably in 1950-2. The high level of demand led manufacturers to offer over-award and overtime wages, in addition to the cost-of-living awards being made by the Court. By raising prices in line with increased direct costs, gross margins were maintained. With increased turnover, the net income of manufacturers rose. This process reduced the real purchasing power and share of national income accruing to farmers from the favourable terms of trade.

This same pricing process raised the wages of factory workers and helped protect, and eventually expand, their share of national income relative to the farmers' (Table VIII). During this period, the Arbitration Court made cost-of-living awards and also granted the £1 rise in the basic wage. These increased costs, as well as over-award payments, were met by manufacturers and transferred to the rest of the community through the pricing process. Thus, money wages and money gross profits increased, and some of the gains of the farm sector were secured for non-farm income earners. In fact, the object of the 1950 rise in the basic wage was to share the farm-based prosperity more widely, and this was effected by the process we have described.

It is within this broader framework that one sees the effectiveness of union and Court in raising the wages of factory workers, and their share of national income. Raising money wage rates protects the worker against rising materials costs and helps redistribute some of the gains first secured by other income groups. So, while the wage share in value added is not increased by union action to raise money wages through the Court, it is true that the union-Court mechanism (cost-of-living awards and reviews based on "capacity") has had a significant effect on the distribution of national income. Herein lies the real justification and purpose of pressure for higher money wage rates. Moreover, the manufacturer is an integral part of the mechanism. The same price policy which stabilizes wage shares in the net income of manufactures helps effect a redistribution of national income in favour of the manufacturing sector as a whole. On the other hand, increased real income for workers, from within the manufacturing sector itself, come not from the redistribution of value added but from increasing productivity. (Cf. Table VI, Columns 4 and 5.)

The bearing of rising money wage rates on relative shares in national income is seen in the following table.

TABLE VIII

Income Distribution—Farm Sector versus Manufactures, 1945-55[9]

Year (1)	Average Weekly Earnings (2)	$\bar{w}$ (3)	Value Added as % of Farm Income (4)	Value Added as % of National Inc. (5)	Farm Income as % of National Inc. (6)	Farm Prices (7)	Farm Output (8)
1945–46	100	50·0	233	26	11	100	100
1946–47	106	49·3	234	29	12	118	99
1947–48	121	49·8	138	27	20	157	119
1948–49	136	50·9	172	28	17	166	119
1949–50	150	49·7	144	28	20	201	125
1950–51	181	49·7	110	27	24	322	119
1951–52	221	50·9	226	31	14	261	112
1952–53	239	49·8	181	29	16	280	132
1953–54	251	48·9	229	31	14	273	133
1954–55	266	48·8	300	33	11	259	134

We can see from this table that:

(i) the share of wages and gross profits in value added is far more stable than the ratio of manufacturing income to either farm or national income;

(ii) shifts in farm income (as reflected in columns 4, 7 and 8) partly account for changes in the shares of wages and gross profits in national income (column 5);

(iii) the rise in farm incomes, 1949-51, resulted in higher levels of general demand. This demand led to pressures on the labour market and so to higher wage rates (column 2). These demand-caused cost rises were followed by proportionate price rises. Larger absolute gross profit margins were received. In this way, there was effected the redistribution of some of the real income first secured by the farm sector;

(iv) the union-Court-employer mechanism carried the wage-price rise forward into 1951-2, when farm incomes were falling. In this way, rising prices for manufactured products and falling farm prices combined to complete the restoration of factory

9. As the wage share is virtually stable at 50% of value added, it follows that the ratio of factory wages to farm income moves proportionately with, and at about half the level of, the value added/farm income ratio, as given in Col. (4). Farm and national income figures are from the *National Income* estimates. Rural price and output series are from the *Monthly Review of Business Statistics* and the *Quarterly Journal* of the Bureau of Agricultural Economics. 'Farm income' represents only the unincorporated enterprises in the farm sector. A paper given at ANZAAS, 1954, by D. Youngman of the Bureau of Census and Statistics, indicates similar, though of course lower, ratios for value added/farm income series of Column (4) when one includes the income of companies engaged in the farm sector. Column (6) would also rise, but still show the same kind of movements as for unincorporated farms.)

wage and gross profit shares in national income to pre-boom levels. This process was completed in 1953-4. Although falling farm prices, 1951-2, helped achieve this restoration, it was the rise in money wage rates, 1950-4, which played the larger part, along with the corresponding rise in industrial prices;

(v) there is a sharp change in the farm-manufactures income relationship in 1954-5. A 6 per cent rise in average weekly earnings, and an equal rise in factory output, compare with a 6 per cent fall in farm prices and stability of farm output. These changes imply a rising pressure of demand from non-farm sectors, and the wage-price mechanism, aided by falling farm prices, effected a rise in the ratio of manufacturing to farm income to a level well above any other post-war year (column 4).

B. *The "Racket-Ratchet" Mechanism of Redistribution*

Two aspects of this mechanism for distributing the gains from the terms of trade throughout the community, and to the manufacturing sector in particular, call for comment. These are what may be called the "racket" and the "ratchet" effects of the mechanism.

First, let us examine the "racket". Even in the late 'twenties, the Tariff Board thought that employers and employees banded together to secure wage increases from the Court and tariff protection for price increases from the Board. In 1927, the Board reported there were simultaneous applications before it and the Court from nine industries. In 1928, the Board appealed for "co-operation between the authorities fixing wage rates and conditions of employment and the framers of the tariff". Renewed experience of this "spiral of its own creation" led the Board to write in its 1953 Annual Report:

> "An industry applying for higher protection because of increased labour costs may argue that in incurring these costs it is simply complying with a legal obligation. Acceptance of this contention could be interpreted as an acknowledgment by the Board that the industrial tribunal is the final authority on the level of costs, and consequently of tariffs. There may be cases where the Board might suspect that an industry did not press its case with sufficient vigour before an industrial tribunal, or that it was too compliant in the matter of conciliation. . . . The tariff could easily be caught up in a spiral of its own creation—the spiral of higher duties, higher prices, higher costs, and again higher duties. This would be the final disaster. . . ."

Whether or not the process is as deliberate as the Board would seem to imply, the manufacturer and factory employee do tend in effect to form a "bloc" opposed to the unsheltered export industries. The Court mechanism is designed to promote "fair shares" by redistributing some of the fruits of one sector's greater "capacity to pay". But, this mechanism could become a "racket" in the hands of employer and employee. This would be the "final disaster" in terms of the effect on the costs of exporters relative to the prices they receive. In any event, circumstances are likely to arise in which the three-part mechanism of price and wage fixing may operate to harm the export

sector and the balance of payments. This is especially true of times when farm prices have weakened, as in 1952-5, relative to demand, prices, and wages in manufactures.

It is here that the "ratchet" effect enters as a reinforcement. For, the record of post-war wages and prices in manufactures has been one of almost continuous upward mobility. There have been no price falls to match those in the farm sector. Nor is any such decline likely while internal demand is at a high level. What, then, is the role of the three-part mechanism (union-Court-employer) in a time of high demand, but relatively weak export income and/or severe import restriction? There is no case for using the mechanism in the customary way to reduce the farm share in national income.

It is in such circumstances, akin to 1955-6, that there is apparent a marked divergence between two meanings of "capacity to pay". It is one thing to try, as if in a vacuum, to give workers a greater share in the prosperity of manufactures. It is quite another to raise money wages because of generally higher "capacity to pay". Manufacturers will protect themselves by maintaining gross margins, thereby placing the burden of the wage-price rise where it will cause most harm—on the export sector, and on the demand for imports. Similarly, in 1956-7, farm prices have not risen enough to permit de-control of imports or to warrant redistribution of higher farm incomes through Court action.

There is, therefore, at least in manufactures, conflict between wages policy in time of high employment and the requirements of balance of payments equilibrium and price stability. The cost-price mechanism, including the operation of the Court, unions, and employers, is not geared to these latter objectives. Rather it is designed to translate demand increases into cost (wage income) and price (gross profit) rises. If government policy checks inflationary pressure, lessened demand may lead to lower over-award payments, and so to some cost and price reductions. But there is no clear indication that business men would lower gross margins in the face of reduced demand. Nor will the union-Court mechanism help lower money costs—unless "capacity" is defined in a sense reminiscent of the early 'thirties to allow a substantial cut in money wages!

The cost-price mechanism, in its three-part form, constitutes a powerful means of securing some of the gains of the terms of trade for non-rural income earners. In this process, there is a common interest between manufacturer and employee. Both gain from higher money wage rates and prices, when the level of demand is high and the farm sector prosperous. One may, however, doubt the advisability of the free working of such a ratchet-type mechanism in periods of reduced farm income. It may, through the pressure of internally-generated demand, lead to still higher costs. This would further weaken the balance of payments and pose the threat of greater import competition —or devaluation. In this way, the mechanism may impose such shackles on economic development and living standards as higher tariffs and continued import controls.

In these circumstances, the Court (now Commission) must remain a relatively passive, but inflation-biassed, institution in the Australian cost-price structure. Initiative lies, rather, with government economic policy, business investment and pricing decisions, and union wage activity—within the framework provided by the market for Australian wool.

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WOOL IN THE NEW ZEALAND ECONOMY[1]

1. *Introduction*

I am frequently offered two popular but opposing views on the question of what part wool production should play in the future growth of the New Zealand economy.

The first view is that, as the capital and labour at present used in producing wool are earning much higher average returns than similar resources are earning in other industries, then our policy should be one which encourages future marginal resources to flow into farming rather than into competing industries. On this view we are committed, by the nature of our resources, to development in farming as the only possible means of increasing real income. This is a relatively unsophisticated view but of course it is not on that account invalid.

The second view, which can be just as unsophisticated as the first, can however, be presented as a coherent logical argument which proceeds as follows:

(i) Wool is eventually doomed by synthetics to the same fate as natural silk.

(ii) The investment of labour and capital in sheep farming would meet severe diminishing returns.

(iii) Any considerable increase in the farm labour force could therefore only be achieved with the accompaniment of a fall in real wage rates and a rise in land values—an undesirable distribution effect.

(iv) It is wiser therefore to encourage our future marginal supplies of capital and labour to flow into import-replacement industries even if these require further protection to offset their lower productivity.

In offering advice as to which of these views is correct the economist must not only apply the special analytical tools at his disposal to the available facts, but he must also try and gauge the future. In particular it is necessary to consider the following strategic questions.

(i) What is the likely future for wool prices?

(ii) What is the marginal physical productivity of capital and labour in

  (a) wool production in New Zealand?

  (b) other industries in New Zealand?

(iii) What is the future of our import prices?

1. This paper was originally presented in January, 1957, to the meeting of Section G and K of the Australian and New Zealand Association for the Advancement of Science. The author is Statistician of the New Zealand Meat and Wool Boards' Economic Service, but the opinions expressed in this article are his own and are not necessarily shared by the New Zealand Wool Board.

This is a tall order and I do not propose to try and satisfy it even if I were able. But, for the purposes of discussion, I intend to put forward a provisional answer to the first question, viz. the likely future of wool prices, and to present some facts relating to the second question, viz. productivity in farming.

The paper proceeds by discussing, in Section 2, the history of wool prices as a preliminary to an assessment of the future in Section 3. Resource productivity is discussed in Section 4 and the argument brought together in Section 5.

2. *Wool Prices in the Past*

The process of price formation in the wool market is difficult to analyse econometrically, because the demand for raw wool is derived from the demand for wool products and there are considerable lags between the time when the price of raw wool is fixed and the time when this price is passed on in the price of the finished product. Accordingly, in previous work[2] on this subject, I have found it convenient to split up the pricing process conceptually into two models.

The first, which I call the short run model, is used to explain the price which rules over any one wool marketing season (or shorter period) and in this model the price is explained by the annual rate of supply of wool, including supply from speculative stocks, in relation to the rate at which wool is being consumed by woollen mills. This rate of consumption may be quite different from the rate at which wool is being consumed by final consumers for a variety of reasons and, as it is the final demand for wool in which we are fundamentally interested for the purpose of securing estimates of the price and income elasticities of demand, then a second model must be used in which the effect of price on the consumption of wool products is explicitly taken account of.

This second model, which I call the long run model, is used to explain the general trend of wool prices in which the inter-seasonal fluctuations which are generated by short run considerations are smoothed out. The long run model explains the trend of wool prices by changes in incomes and in the supply of wool. It takes more than a year for raw wool prices to be passed on in the prices of wool clothing and a further period then elapses before final consumption shows a response to any changes in prices, which response in time duly affects mill consumption, which affects the price of raw wool, and so on. To analyse wool prices in terms of income and supply of wool necessitates therefore working in moving averages to allow for time for these lagged responses to work themselves out.[3]

2. B. P. Philpott: "Fluctuations in Wool Prices 1870-1953", *Yorkshire Bulletin of Economic and Social Research*, University of Hull, March, 1955, p. 1. This article gives a full description of the logical basis on which these models are built up, of which the above is a most unsatisfactory condensation.

3. Of course the two models can, and should be, combined into one in which the whole process of price formation is explained in terms of final demand and supply but the available statistical data are not sufficiently detailed to allow such a model to be tested and it is therefore of little use.

These two models have proved reasonably successful in explaining historical fluctuations in wool prices over the last 80 years, and in forcasting future price movements. In this paper, however, we are only concerned with the long run model, in which changes in deflated wool prices are explained by changes in world income, in world supply of wool and in the prices of substitute fibres (all expressed as five-year moving averages). The results presented below are a further development of earlier work, in that the supply and income variates have been placed on a *per capita* basis by deflating them with an index of world population. This procedure seems necessary if one is to secure logically satisfactory estimates of price and income elasticities of demand from the analysis, but the construction of an index of world population has involved so much estimation and interpolation as to make one doubt whether the effort was justified. However, the results are not unsatisfactory as will be seen later.

The model explains changes in wool prices (deflated by an index of general retail prices) by changes in *per capita* world income, in *per capita* world supply[4] of wool and wool type synthetics, and in an indicator of the prices of substitute fibres. Full details of the time series used and of the regression equation are given in the Statistical Appendix to this paper. Here I merely give in Table I the averages, for five-yearly periods, of the data used.

TABLE I

Data Used for Wool Market Model

Period	Dependent Variable	Explanatory Variables			
	(1) Wool Prices deflated by Retail Prices	(2) Per Capita World Supply of wool and wool type synthetics	(3) Per Capita World Industrial Production	(4) Cotton Prices deflated by Retail Prices	(5) Per Capita World Supply of Wool
	Index Number on Base 1934-38=100				
1921 to 1925 ..	140·3	101·7	79·1	166·8	101·7
1926 to 1930 ..	132·6	101·2	100·5	129·4	101·2
1931 to 1935 ..	77·2	103·3	81·5	92·5	103·3
1936 to 1939 ..	97·4	99·6	103·5	92·4	99·6
1946 to 1950 ..	132·6	122·0	126·9	198·1	121·6
1951	358·0	103·5	149·2	272·9	100·3
1952 to 1956 ..	168·4	110·0	167·6	180·9	98·5
1956	146·1	120·9	181·4	170·0	101·3

4. As we wish to use the model to estimate the price elasticity of demand, care must be taken with an equation in which prices are made dependent, amongst other things, on changes in supply. For we run the risk of securing a coefficient, between supply and price, which is a mixture of the supply elasticity and the demand elasticity. In the present case there is considerable evidence that, in so far as wool production is determined by wool prices, it is the prices lagged by some five years which are the determining influence (*ibid.*, p. 2). Wool supply in the above equation can therefore be regarded as a predetermined variable exercising an autonomous and one-way influence on prices.

The following are some brief notes on the variables given in Table I.

Column 1.—*Wool Prices Deflated by Retail Prices*

This is regarded as the dependent variable, the changes in which are to be explained by the variables in columns 2, 3 and 4.

Column 2.—*Per Capita World*[5] *Supply of Wool and Wool Type Synthetic Fibre*

The synthetic fibres included with wool, in this supply variable, are described below in Section 3. Production of significant quantities only commenced around 1950, but it has increased rapidly and must have had a considerable effect on wool prices. Hence the quantity of these fibres must be included above with wool in the supply variable. The supply figures are deflated by an index of world population.

Column 3.—*Per Capita World Industrial Production*

This is used as an indicator of *per capita* world income. As an alternative to this, world income (or a large proportion of it) can be calculated from the figures of real national income in international units given by Colin Clark. However, these figures are not at present available for years much earlier than 1920 or later than 1947, while the index of world industrial production *is* so available. The justification for using this index is that it is very closely correlated with world income calculated in international units. The correlation is such that a change of 1 per cent in the index of industrial production is associated with a change of 0·45 per cent in world real income.

Column 4.—*Cotton Prices Deflated by Retail Prices*

This is used as an indicator of the price of fibres, such as rayon as well as cotton, which are to some extent substitutes for wool in the manufacturing process.

Column 5.—*Per Capita World Supply of Wool*

This series is only shown for the purposes of comparison with the *per capita* supply of wool and wool-type synthetic fibres with which it is identical up to the year 1950. The very large rise in this index for the period 1946-50 is due to the liquidation of stockpile wool accumulated over the war years. For other periods the supply of wool is identical with production of wool.

5. I use the word "world" here and later in a rather special sense. The world I am thinking of, and using, consists mainly of those countries which are large producers or traders in wool and wool products and collectively they make up the *world wool market*. Fortunately these countries also happen to be mostly the countries for which there are adequate statistical data not only on wool supply but also for income or industrial production. Nevertheless, certain countries, e.g. Russia and India, which are considerable wool producers or important marginal importers of wool products, have to be omitted either from the supply variable, because there are no statistics of wool production, or implicitly from the income variable, because they are not included in the world index of industrial production.

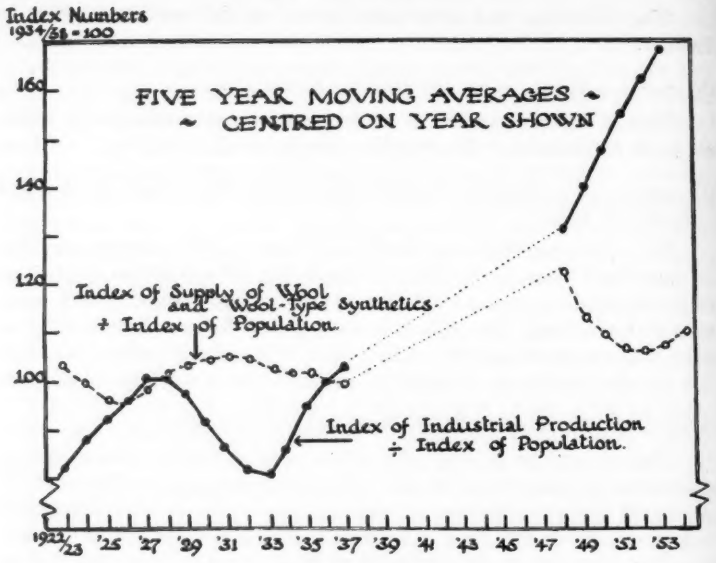
Index Numbers
1934/38 = 100
160
140
120
100
FIVE YEAR MOVING AVERAGES
CENTRED ON YEAR SHOWN
Index of Supply of Wool and Wool-type Synthetics ÷ Index of Population
Index of Industrial Production ÷ Index of Population
1922/23 '25 '27 '29 '31 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51 '53

DIAGRAM I

World Industrial Production and Wool Supply Deflated by Population.

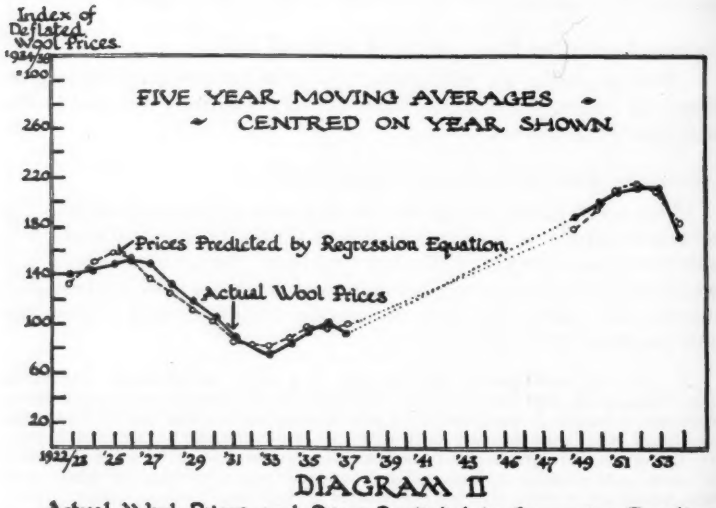

DIAGRAM II

Actual Wool Prices and Prices Predicted by Regression Equation

Diagram I shows the course of the two main explanatory variables over the period. The results of the regression analysis are shown in Diagram II. This gives a comparison of actual prices with prices predicted by the regression equation. It is evident, from this diagram, that a very satisfactory explanation of changes in the trend of wool prices is secured.

The regression equation on which this diagram is based indicates that the following relationships apply. In the absence of changes in the prices of substitute fibres:

(i) A rise of 10 per cent in *per capita* supply of wool and wool-type synthetic leads to a fall of 18 per cent in deflated wool prices, in the absence of any change in *per capita* world income. From this relationship it is easy to calculate that the price elasticity of demand for raw wool is about —0·55.

(ii) With a rise in world income of 10 per cent, and in the absence of any change in supply wool, prices rise by 11 per cent which equals the percentage rise in *per capita* income multiplied by the ratio of the income elasticity to the price elasticity. Given a price elasticity of —0·55 the income elasticity must be 0·60.

These estimates of the price and income elasticities of demand —0·55 and 0·60 respectively can be compared with estimates secured by other methods.[6] Firstly, they can be secured (after some adjustment) from the demand functions for wool clothing for one or two countries which have suitable time series data for such calculations. Secondly, the income elasticity for wool clothing can be estimated from family budget data for a wider range of countries. Lastly, the income elasticity can be calculated from analyses of the quantities of wool consumed per head in different countries compared with real incomes per head (in international units) in those countries. These alternative methods yield results suggesting that the price elasticity of demand for raw wool is approximately —0·4 and the income elasticity is between 0·7 and 1·0.

These estimates differ somewhat from those obtained from the regression equation given above, but they are probably the more reliable of the two. For, though they are based (except for the international comparison of wool consumed per head) on a small number of countries as compared with the complete market coverage afforded by the model, the data on income and population[7] are much more accurate and reliable and I am inclined to place more faith in them for this reason.

Accordingly in the next section where an attempt is made to assess the future prospects for wool prices, I have assumed price elasticity of —0·4 and an income elasticity of 0·85.

6. Further details of these methods and results will be found in Philpott, *op. cit.*, p. 14.

7. Slightly higher income elasticities (up to 0.97) and lower price elasticities down to —0.25 are secured when the variable for income in terms of international units is used instead of the index of industrial production, or when the income and supply variables are undeflated by population. *Ibid.*, p. 12.

3. *Wool Prices in the Future*

In the following argument I propose to look forward to the year 1975 and to compare the projected situation in that year with the situation in 1956.

(a) *Future Demand for Wool*

Assuming that there is no change in tastes, the future world demand for wool at 1956 prices depends on future world *per capita* incomes and on population. As far as world population is concerned the present rate of increase, viz. 1·5 per cent per annum, may be assumed with the support of some demographic evidence,[8] to continue in the future. Forecasts of increases in real income per head are not as easy to find. The present rate of increase (calculated on the basis of the world index of industrial production deflated by population) is about 2·5 per cent per annum, but of course this is heavily weighted in favour of advanced industrial countries where the income elasticity of demand for wool is probably lower than it is in under-developed countries. But provided there is an adequate flow of international investment in the future it would not be unreasonable to assume an average rate of increase in world *per capita* income of 2 per cent per annum.

On these assumptions and using an income elasticity of 0·85 per cent the total demand for wool would rise by 3·2 per cent annum to a level in 1975 which would be 81 per cent higher than 1956.

(b) *Future Supply of Wool*

From 1920 to 1950 world wool production increased about 1·2 per cent per annum, but since 1950 the rate has increased to over 3·0 per cent per annum. This increase is mainly due to a phenomenal rise in the annual rate of increase in Australia, which has risen to over 5 per cent per annum, in part a result of the continued absence of drought and of the success in virtually eliminating rabbits. Australia produces nearly a third of total world wool production and so the future rate of increase in world production depends very largely on what rate eventuates in Australia.

The control of rabbits cannot contribute any further increases in production—indeed there is evidence that the rabbit population is again increasing and that further efforts will be needed to control them. As far as serious drought is concerned this is an eventuality, which each year becomes more imminent and which would have a drastic effect on the long-term Australian rate of increase. For these reasons many observers[9] find it difficult to predict a future rate of increase in world production of more than the long-term pre-war rate 1·2 per cent per annum. A prediction of a rate as low as this seems to

8. F.A.O.: *Natural and Man Made Fibres* (Rome, 1954), p. 27.
9. P. A. Reid: "Future of Wood in the Fibre Market", *Wool and the Australian Economy* (The Economic Society of Australia and New Zealand, Sydney, 1955), p. 37.

me to be too much determined by historical trends and to take too little account of the economics of the situation. The relationship between wool prices and costs has been reasonably favourable for some years now and is providing considerable investment resources for increasing production and I see no reason why the future rate of increase should not be much higher than pre-war provided wool prices remain at their present level. To say this is of course to beg the whole question, for it is the future of wool prices which we are attempting to assess. Ideally, if we knew anything about the supply elasticity for wool, we would use that information, in conjunction with our estimate of future demand, to derive simultaneously an estimate of future prices and future production. But as yet we know little about the supply function for wool and our only course is to extrapolate past production trends with an adjustment for changed conditions of supply. In what follows I have therefore assumed a future annual rate of increase in world wool production of 2 per cent per annum, which is the rate that would result if the annual Australian production increase fell from its present 5 per cent per annum to 3 per cent per annum.

With a rate of increase of 2 per cent per annum, world wool production in 1975 would be 46 per cent above the 1956 level.

TABLE II

Supply and Demand in 1975

	Unit	1956	1975
1. *World Demand (at 1956 prices) for Wool Type Fibres.*			
(1) Demand in 1956			
(a) for wool	mn. lb. clean	2,710	—
(b) for wool type synthetics ..	,,	340	—
Total		3,050	
(ii) Demand in 1975 assuming annual increase in demand of 3·2% = 81% in 19 years	,,	—	5,521
2. *World supply of Wool*			
(i) Supply of wool in 1956	mn. lb. clean	2,710	—
(ii) Supply of wool in 1975 assuming annual increase of 2·0% = 46% in 19 years		—	3,957
3. *Excess demand for Wool*	mn. lb. clean		1,564
4. Excess demand as % of 1956 production of wool type synthetic fibres ..	%	—	460

The argument up to this point can be conveniently summarized in a table. Table II shows the projected 1975 position in terms of pounds of fibre.

On our assumptions, the demand at 1956 prices for wool-type fibres will exceed the supply of wool in 1975 by 1,564 million pound.

In this event either wool prices must in the interim have risen considerably to balance supply and demand or, what is more likely, there must in the meantime be an increase in synthetic production to fill the gap. In fact the production of wool-type synthetics would have to rise to 460 per cent of the 1956 output, and if this happened, wool prices would be unchanged. If synthetic output increased more than this the prices of both wool and synthetic would fall by an amount determined by the quantity, in conjunction with the price elasticity of demand.

A brief consideration must therefore be given to the question of increased synthetic production.

(c) *Wool-type Synthetic Fibres*

The fibres to which I refer are the newer non-cellulosic types such as Terylene, Dacron, Orlon, etc., as distinct from the older non-cellulosic nylon, and from the cellulosic fibres such as rayon. While it cannot be claimed that these fibres possess all the valuable characteristics of wool, especially for apparel, the manufacturers do claim that they possess, to a varying degree, some individual qualities not possessed by wool and this enables them to compete with wool in spite of their relatively high price. Significant quantities of these fibres were first produced around 1950 and since then production has increased at about 40 per cent per annum (mostly in the United States). On the face of it, then, an increase of 8 per cent per annum, which would produce enough synthetic to fill our estimated wool demand-supply gap is a modest aim which would technically be easy to achieve.

But I feel there is much more to it than this. Apart from anything else a spectacular rate of increase in output is always possible for an entirely new industry and already there are signs that the rate of increase is slowing down to something more like 16 per cent per annum. Basically, the supply of these fibres will depend on their cost of production in relation to the expected price at which they can be marketed. As far as costs are concerned, it seems that they are expensive to produce compared with wool—especially crossbred wool. It has been estimated[10] that the lowest cost at which they can be produced—when allowance has been made for all economics of large-scale production—is around 100d. lb. The reasons for these high costs are to be found in the expensive chemicals used, the elaborate and expensive plant required,[11] and the very high research expenditures which must be written off. Not only are the production costs high, they are also very inflexible compared with the cost of wool production, so much of which is represented by management reward and income capitalized into land values.

As far as future realizable prices of synthetic are concerned,

10. P. M. McMahon: "Thoughts on the Technology of Wool Production", *Wool Technology*, N.S.W. University of Technology, Sydney, 1954, p. 87.

11. A. Johnson: "The Influence of Synthetic Fibres on Wool", *Wool*, Massey College Wool Association, Palmerston North, N.Z., 1956, p. 28. Professor Johnson gives the research and development costs of Terylene as £18 million and the capital cost of the 11 million pound plant as £11 million.

these depend, as I have shown, on how much is produced in relation to the gap between the demand for wool-type fibres and the supply of wool.

The synthetic industry is strongly characterized by oligopoly and in view of the higher and more inflexible production cost, it seems to me most unlikely that synthetic output will increase to a point where prices of wool and synthetic are forced down below synthetic production costs.

It is of course possible to argue that synthetic production costs may register dramatic falls in the future, especially if there are increasing returns to scale. Such increasing returns if they exist would have to accrue as the result of the size of the industry, and not the plants, as it is fairly certain that plants already built are designed to produce an output absorbing all possible economies of scale. Economies could accrue from outside the industry, e.g. from specialization in the section of the chemical industry which supplies the synthetic industry, but any economies from this direction are just as likely to be cancelled out by rising costs of coal and oil on which the chemicals are based.

The view of the synthetic industry, to which this argument then leads us, is that it is distinctly a marginal source of supply. This view is supported by the fact that while synthetic producers were full of optimism for the future during the wool shortage and high prices of 1951, there is now evidence[12] that they are displaying in their investment plans a much greater degree of caution as a result of the sustained and substantial increase in world wool production.

(d) *Conclusions*

The argument which has preceded seems to justify the following conclusions.

(i) While there may well be some decline in the price of wool in the foreseeable future there is not likely to be a great and disastrous fall due to a wholesale capture of our market by synthetics.

(ii) The best defence for wool against synthetic fibres is to produce more wool and in this way to put synthetic producers on the defensive, on the grounds that they have more to fear from falling prices than wool producers do. Moreover, a plenitude of wool is likely to lower the incentive for further research into new fibres. And again it would obviate the risk of an irreversible change in consumer tastes away from wool towards synthetic fibres.

(iii) This conclusion is not vitiated by any marginal errors—the likelihood of which I would be the first to admit—in the assumptions made about future population and real income increases, unless of course the errors were of such magnitude as to change the projected situation of excess demand for wool into one of excess supply.

12. See R. B. McMillan: "The Future of Wool in the Fibre Market", *Wool and the Australian Economy, loc. cit.*, p. 33.

(iv) While we can't hope for much more than the assumed increase of 2 per cent per annum in world wool production we can profit considerably by raising our own rate of increase in New Zealand (at present about 3 per cent per annum). I have suggested that the price elasticity of demand for wool is approximately —0·4, but, as we only produce about one-tenth of the world wool supply, the price elasticity as far as New Zealand is concerned is 4·0, so that increased production would by and large yield increased returns.

We must ask now whether this conclusion, viz. that from the point of view of prices, a rapid expansion in New Zealand wool production is desirable, is in any way impaired by the fact that the quantity of extra resources required to effect the increase may be so great, and the productivity of the resources may be so low, as still to render such a policy uneconomic.

4. *Farm Productivity in New Zealand*

Though the N.Z. Meat and Wool Boards' Economic Service has recently commenced work on a study of productivity and production functions in sheep farming, the results are not yet in a form suitable for presentation here. This section wil therefore have to be discussed in terms of productivity of *all* New Zealand farming. This is itself a subject on which, strangely enough, very little is known. While there is no guarantee that any conclusions reached about productivity over the whole range of New Zealand farming are automatically applicable to the sheep farming sector, there is a presumption that a broad correspondence applies and in any case this is the best that can be done for the present.

(a) *Productivity and Efficiency*

Table III on page 228 (together with the notes to the table on the page preceding it) gives interim results from a study (as yet unpublished) of resource productivity in New Zealand farming from 1920 to 1956 which is being conducted by the writer with the collaboration of Mr. J. D. Stewart of Canterbury Agricultural College.[13]

Line 1 of the table shows that the volume of farm output has increased at the rate of 2·1 per cent per annum in the twenty-five years between 1929 and 1954. The gross productivity of labour in farming as shown in line 3, has increased at the rate of 2·2 per cent per annum. In my view, however, this gross productivity figure has little significance as we do not know to what extent it is the result of increased use of other inputs and to what extent due to an increase in the efficiency with which all inputs are used. By efficiency I mean the increased output which results from new techniques and better management

13. I should like to stress that the figures given for the year 1929 and 1954 in this table should not be regarded as definitive. I should have preferred to delay their publication until they had been checked by using alternative methods. However, the results seemed so appropriate to the subject of this paper as to merit inclusion in it, in spite of their provisional nature.

practices which do not require new resources but merely result from a better utilization of existing ones.

To answer this question it is necessary to have an estimate of the inputs used in farming. The estimated value of these inputs for the years 1929 and 1954 are shown in line 17 of the table. They are derived from the figures preceding them (viz. total fixed capital used in line 7, total working capital line 8, unimproved land line 10, and labour line 13).

The calculation, in line 18, of output per £100 of all inputs shows that the increase in efficiency has been at the rate of 1·0 per cent per annum. That is to say that for 25 years, without the use of any additional resources, farm output has been rising at the rate of 1·0 per cent per annum as a result of better farm management, newer techniques, better quality of livestock, etc.

Sources and Notes to Table III

Source: Interim results from a study of resource productivity in New Zealand farming 1920-56 by B. P. Philpott and J. D. Stewart—as yet unpublished.

Notes: The new series, on which comment is required, are:

Line 4: Value of Farm Improvements.—These are the values of improvements for all country land deflated by a new index of the costs of farm improvements.

Line 5: Value of Plant and Machinery.—This series has been built up on the base of plant and machinery figures given in the 1950 Census of Agriculture. Annual gross investment, at constant prices, in plant and machinery was calculated from import and local production statistics, and from these figures, net investment and the value of real capital secured by allowing depreciation.

Line 6: Value of Livestock.—Numbers of Sheep, Cattle and Pigs at 1949-50 prices.

Line 8: Working Capital.—This represents all farm expenses, except wages, rent and interest, and the series was built up from the estimates of net farm income, given in the censuses of Income 1926, 1936 and 1945, in conjunction with the official gross farm income series. The 1954 figure is derived from the Farm Sector Account for that year. All figures were deflated by the wholesale price index, and converted to base 1949-50 = 100.

Line 10: Land.—For the purposes of this paper, the occupied land area was regarded as unchanged, whereas it has in fact fallen very slightly. The value shown for land is the unimproved value of county land in 1949-50.

Line 13: Labour.—The annual input of labour has been calculated at £400 per male equivalent employed.

TABLE III

Input and Output in New Zealand Farming, 1929 and 1954

Item	Unit	1929	1954	1954 As % of 1929	% Rate of Change (Compound)
1. Value of Farm Output (at 1949/50 prices)	£mn	133·3	224·5	168·4	2·1
2. Full time male equivalents working on farms (3 females = 2 males)	No.	130,000	126,000	96·9	
3. Gross output per full time male equivalent (at 1949/50 prices) (Line 1 ÷ Line 2)	£	1,025	1,782	173·8	2·2
CAPITAL EMPLOYED IN FARMING					
4. Value of farm improvements (at 1949/50 prices)	£mn	229	388		
5. Value of Plant and Machinery (at 1949/50 prices)	£mn	25	62		
6. Value of Livestock (at 1949/50 prices)	£mn	126	183		
7. *Total Fixed Capital* (at 1949/50 prices)	£mn	380	633	166·5	
8. Working Capital (at 1949/50 prices)	£mn	37	62	167·5	
(i.e. all farm expenses excluding labour, interest and rent)					
9. *Total Fixed and Working Capital* (at 1949/50 prices)	£mn	417	695	166·6	2·1
10. Land (unimproved value) at 1949/50 prices	£mn	175	175		
11. *Total Fixed & Working Capital & Land* (at 1949/50 prices)	£mn	592	870	147·0	
12. *Ratio of Capital and Land to Output* (Line 11 ÷ Line 1)		4·44	3·87		
ANNUAL FARM INPUT					
13. Annual Input of Labour at 1949/50 wage rates	£mn	52	50		
14. Annual land input at 5% of total value	£mn	9	9		
15. Annual fixed Capital Input at 5% of total value	£mn	19	32		
16. Annual Working Capital Input	£mn	37	62		
17. *Total Annual Inputs*	£mn	117	153	130·7	
18. *Output per* £100 *of all Inputs* (Line 1 ÷ Line 17)	£	114	147	128·9	1·0

(b) *The Marginal Product of Capital in Farming*

The increased output, which occurred after allowing for this increase in efficiency, can be imputed to the increased input which was used over the period, viz. fixed and working capital and, as the labour input was virtually unchanged as between the two years, this additional

output (net of the effect of efficiency) can be regarded as the marginal product of capital. The calculation of this marginal product is illustrated in Table IV using figures from Table III.

TABLE IV

Marginal Productivity of Capital

Item	1929	1954	Change between 1929 and 1954
		£mn	
1. Total Output	133·3	224·5	91·2
2. Less increase attributable to increased efficiency in use of inputs = 28·9% of £133·3mn.	—	—	38·5
3. Change in Output attributable to Capital	—	—	52·7
4. Total fixed and Working Capital ..	417·0	695·0	278·0

5. Marginal Product of Capital $= \frac{52{\cdot}7}{278{\cdot}0} = 19.0\%$

The calculations in Table IV indicate that the marginal product of the additional capital invested in New Zealand farming between 1929 and 1954 amounts to about 19 per cent. This must be regarded as an excellent marginal return to capital and, though there is little information to provide a comparison, it is probably well in excess of marginal returns earned in New Zealand manufacturing, especially if manufacturing output were valued at world prices instead of at higher protected internal prices. But it must be remembered that the figure refers to the comparison between the years 1929 and 1954, and between those years marginal returns may have been diminishing fairly rapidly. For this reason it would be unwise to assume *that at the present time* the marginal product of capital in farming is of the order of 19 per cent. However, there is some evidence that there has not been, over this period, sharply diminishing physical returns to capital in that there has not been a rapid decline in the average net return to capital (calculated net of labour and land input and after allowing for the change in output attributable to the increase in efficiency). A definite conclusion on the question will however have to await the completion of a detailed econometric study of the whole period.

(c) *The Marginal Product of Labour in Farming*

Even approximate estimates, such as the one just presented for capital, are as yet not available for the marginal product of labour and the discussion must be entirely qualitative and therefore brief.

I think we should be safe in presuming that, as a result of the increased quantities of capital invested in farming in recent years, the marginal product of labour has recently risen fairly rapidly, whatever its absolute value is at present. Initially much of the increased capital used in New Zealand farming was a substitute for labour, which is relatively costly in this country. But much of the capital now being invested in sheep-farming (e.g. fertilizer) and also many of the newer

techniques being introduced (e.g. the introduction of anti-biotics) are complementary to labour and more labour is going to be required if the use of this capital is to be fully justified. There is no substitute for the labour required to handle the greatly increased numbers of sheep being carried (and likely in the future to be carried) under modern sheep farm management conditions with the detailed attention that must now be given to grazing management and to the constant and unavoidable handling of sheep themselves.

Even if the marginal product of labour in sheep farming is higher than in other activities, there is still no presumption that the demand for sheep farm labour will increase greatly in the immediate future with our present size of sheep farms, many of which are in the stage of moving towards a position where another man will be required, but are in the meantime in the position of requiring only half a man—a problem which can only be dealt with by the introduction of casual farm labour schemes.[14]

This is not to say that further expansion in sheep farming will not absorb, on its own account, part of the increased labour force of the next 20 years, but it does seem likely that this absorption will occur indirectly into enterprises furnishing and replacing the physical fixed and working capital required. The magnitude of this draught on our labour resources would be a fruitful study in the field of interindustry input-output relationships using our National Income Sector Accounts.

(d) *Conclusions*

On the basis of provisional data we concluded that:

(i) The efficiency with which all farm inputs has been used rose 1 per cent per annum between 1929 and 1954.

(ii) The marginal product of the capital invested in farming between 1929 and 1954 was 19 per cent.

(iii) We cannot be sure, but the marginal product of capital in farming does not appear to have diminished rapidly over this period and it is probably still high. In any case any tendency towards severe diminishing returns has been offset by the increase in efficiency as in (i) above.

(iv) Nothing quantitative can be said as yet about the marginal product of labour in farming.

Provisional as they are, these conclusions suggest that the economic gain to New Zealand of an expansion in wool production (which in Section 3 we concluded was justified on the grounds of prices) would not be offset by sharply diminishing marginal productivity of the additional resources required.

5. *Conclusion*

We have reached the conclusion that, from the available evidence on productivity, there is a strong presumption that we should recom-

14. On this point see R. H. Bevin, *Farm Labour in New Zealand*, N.Z. Meat and Wool Boards' Economic Service, Christchurch, 1953, p. 7.

mend an economic policy which encourages a rapid expansion in wool production; and that such a policy is fully justified from the point of view of wool prices.

Before the matter is left there, there is one final consideration which cannot be ignored. This concerns the future of fat lamb prices. Wool and lamb are complementary products over a wide range of New Zealand sheep farming and a rapid expansion in wool production, with our present sheep farming practices, would necessarily bring with it an almost equivalent increase in lamb production. The market for lamb is, at present, almost entirely confined to the United Kingdom, the population of which is almost stationary and, with a low price elasticity of demand, the prospects of selling a greatly increased quantity of lamb at present prices is not good. A falling price for lamb could quite easily cancel out the prospective gains from wool. There are two methods of meeting this disturbing situation. The first method is to shift some of the emphasis in sheep farming at the margin, from lamb production to wool production. I do not think this would be as difficult as we are inclined to think—accustomed as we are to regarding the production of wool and lamb as fixed in immutable joint proportions—and there are possibly areas of farming country where a policy of maximizing wool production per acre could with profit be substituted for the present policy of attempting to achieve, at high cost, a satisfactory balance between wool production and lamb production. Provided the value of the increase in wool produced was greater than the value of the decrease in lamb production, we would be better off.[15]

Secondly, we may be able to enlarge the market for lamb in the United Kingdom by forcing that country to lower its home production of meat. United Kingdom meat production had by 1955 increased by 25 per cent compared with 1938 and this increase has been achieved at a marginal cost much higher than the price of imported meat.[16] While this movement away from the free trade position has received strong theoretical support from some academic opinion,[17] if we were to offer greatly increased quantities of lamb, we could expect some revision of this high cost policy which could perhaps lead to a comparable retraction of United Kingdom meat production. This would lessen considerably the severity of any prospective fall in lamb prices.

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15. An example of this policy which immediately springs to mind is the carrying of wethers instead of breeding ewes on areas of difficult hill country. This would increase wool production per acre because, compared with ewes, more wethers, each clipping more wool, could be run, and the costs associated with the maintenance of breeding stock and rearing of lambs, avoided. That this would be profitable is of course only a hypothesis which requires substantiation from further research, but I mention it to show that we should not become too wedded to the idea of regarding all our sheep-farming country as one big potential fat-lamb farm.

16. See E. F. Nash "Some Reflections on Agricultural Policy", *Lloyds Bank Review*, July, 1956, p. 40, and "The Competitive Position of British Agriculture", *Journal of Agricultural Economics*, June, 1955, p. 222.

17. E. A. G. Robinson: "Living Within Our Foreign Earnings", *Three Banks Review*, March, 1954, p. 3.

STATISTICAL APPENDIX

The long run wool market equation in simplified form is derived as follows:*

Let the long run demand equation for wool be =

1. $\text{Log } CW = a - b \text{ Log } Pw + c \text{ Log } Y + d \text{ Log } p_o$

Where CW represents per capita consumption of wool in the form of clothing
Pw represents the price of wool
Y represents real income per head
p_o represents price of substitute fibres.

It is assumed that the production of raw wool in so far as it is determined by the price of wool, is determined by the price of the preceding period, and can therefore be regarded as predetermined and equal to consumption.

2. $W = CW$. Where W represents the supply of wool.
In equation (1) set $W = CW$ and solve for Pw.

3. So $Pw = a - \frac{1}{b}\text{Log } W + \frac{c}{b}\text{Log } Y + \frac{d}{b}\text{Log } p_o$

Where $\frac{1}{b}$ = the inverse of the price elasticity of demand for raw wool

$\frac{c}{b}$ = the ratio of the income elasticity to the price elasticity.

$\frac{d}{b}$ = the ratio of the price elasticity of consumption of wool with respect to the price of substitute fibres, to the price elasticity of demand for wool.

The data used to test this equation statistically are given in Table V overleaf.

Pw = Deflated wool prices (column 1)
W = Per capita supply of wool and wool type synthetic (column 3)
Y = Per capita world industrial production (column 4)
p_o = Deflated cotton prices (column 5).

All variables expressed as five-year moving averages.
The regression equation is: (Calculated in five-year moving averages).

$$\text{Log } Pw = 3{\cdot}0044 + 0{\cdot}4937 \text{ Log } Y - 1{\cdot}8556 \text{ Log } W + 0{\cdot}8624 \text{ Log } p_o$$
$$R^2 = 0{\cdot}9883.$$

NOTES TO TABLE V

Column 1. *Deflated Wool Prices.*—Unweighted average of clean price of 64's and 50's in sterling at London market, divided by the unweighted average of U.K. and U.S.A. retail price indices (U.S.A. expressed in sterling equivalent). Refers to year ended 30th June of year shown.

Column 2. *Per Capita Supply of Wool.*—Clean wool production in United Kingdom, United States of America, Australia, New Zealand, South Africa, Argentine, Uruguay, plus disposals from official wool stock piles. (B.A.W.R.A. 1920-4 and J.O. 1946-50), divided by world population index—column 6. Refers to year ending 30th June of year shown.

Column 3. *Per Capita Supply of Wool and Wool-type Synthetics.*—Wool production as in column 2, plus sales of wool-type synthetic, i.e. Terylene, Ardil, Fibrolane, Dynel, Saran, Vicara, Orlon, Acrilan, Dacron, Polyethelene, Vinyon, Amilan, Vinylon—divided by index of world population column 6.

* This is a simplified version of the model given in *Yorkshire Bulletin,* March, 1955, which is built up rigorously from the wool clothing demand function, and the manufacturers' demand function for raw wool.

TABLE V

Data Used for Regression Analysis

Year	Deflated Wool Prices (1)	Per Capita Supply of Wool (2)	Per Capita Supply of Wool and Wool Type Synthetic (3)	Per Capita Index of World Industrial Production (4)	Deflated Cotton Prices (5)	World Population (6)
1921	128·6	103·8	103·8	77·6	94·9	85·3
1922	92·0	120·1	120·1	66·6	153·6	86·4
1923	132·7	104·5	104·5	80·6	212·6	87·3
1924	159·0	90·7	90·7	83·6	206·8	88·5
1925	189·3	89·5	89·5	87·3	166·3	89·5
1926	134·2	94·9	94·9	93·0	121·8	90·5
1927	131·1	101·7	101·7	95·2	127·3	91·6
1928	153·1	100·2	100·2	100·8	148·4	92·7
1929	143·0	103·4	103·4	103·5	140·2	93·6
1930	101·6	105·6	105·6	109·9	109·5	94·6
1931	71·8	104·0	104·0	95·1	77·0	95·3
1932	60·7	104·8	104·8	81·3	78·8	96·3
1933	64·3	107·4	107·4	69·0	86·8	97·3
1934	111·6	101·0	101·0	77·1	111·2	98·1
1935	77·7	99·5	99·5	84·8	108·7	99·1
1936	94·5	98·8	98·8	93·7	107·3	100·0
1937	115·1	100·6	100·6	104·6	98·0	100·9
1938	101·3	99·2	99·2	113·7	75·7	101·9
1939	78·8	99·9	99·9	102·2	88·6	102·9
1946	98·0	146·0	146·0			109·8
1947	98·0	116·5	116·5	114·8	182·5	111·3
1948	138·0	119·2	119·2	126·3	185·0	113·3
1949	162·1	112·8	112·8	133·3	195·3	114·8
1950	166·8	113·7	115·3	133·3	229·6	116·6
1951	358·0	100·3	103·5	149·2	272·9	118·5
1952	173·9	94·8	100·0	158·8	217·7	120·0
1953	178·5	97·0	103·5	160·3	169·3	121·7
1954	182·4	99·5	108·4	169·9	179·3	123·4
1955	161·1	100·1	117·4	167·6	169·2	125·4
1956	146·1	101·3	120·9	181·4	170·0	127·4

Column 4. *Per Capita Industrial Production.*—To 1939. Index of World Industrial Production from F. Hilgerdt, *Industrialization and World Trade* (League of Nations, 1942). From 1946, United Nations Index of World Industrial Production. Refers to calendar year preceding year shown.

Column 5. *Deflated Cotton Prices.*—Index of spot price of American Middling Cotton, Liverpool, divided by same deflator as wool prices, column 1.

Column 6. *World Population.*—Population of Europe, North America, South America, Australia, New Zealand, Turkey, Japan, from United Nations Demographic Year Book. Up to 1932, interpolations by author on basis of published rates of growth.

THE CHOICE OF FARM ENTERPRISES USING LINEAR PROGRAMMING

For many economists linear programming is a closed book because of the mathematics of the technique. It is the intention of this article to give a simple example to demonstrate some of the basic concepts of programming while still retaining enough reality to show the usefulness of the procedure in the field of agricultural economics. It is also hoped that such an illustrative example will be of use to those who are still puzzled as to what linear programming is all about. The field of application of linear programming (activity analysis) has ranged from the study of whole economies, as in those on the American economy by Leontieff,[1] to problems of choosing a minimum cost dairy feed.[2] Here, the illustrative example will be given first. Later a geometric presentation of some of the basic ideas of linear programming will be set out.

The situation dealt with here concerns a hypothetical farm in the south-east of South Australia where the producer has a choice of possible enterprises and has to choose that combination of enterprises which will maximize total revenue. One way of choosing a farm plan, or production programme, is to use the budget procedure.[3] In this procedure the budgeteer considers a number of possible plans and chooses the plan that seems to give the highest net profit. Implicit in the procedure is a knowledge of the resource requirements for the enterprises considered and an assumed set of prices. Clearly, only a few of the possible plans can be considered. Thus, 150 crossbred ewes, 600 merino wethers and 15 beef cows might constitute one plan and 130 crossbred ewes, 550 merino wethers and 20 beef cows might constitute another plan. Changes in the number of animals in each category yield different plans. The number of possible changes in numbers is very large, so that the number of possible plans is very large and there is no guarantee that the plan finally chosen from the limited number of budgets which can usually be considered will be the one which maximizes net profit. Linear programming does provide a means of selecting the optimum plan from the set of possible plans.

The farm and resource situations for this example are the following: The farm size is 640 acres. Of this area 20 acres are arable land, 320 acres are sown to subterranean clover and perennial rye, 200 acres are top-dressed subterranean clover and 100 acres are idle scrub land, roads, homestead area, etc. The resources available consist of a two-

1. W. W. Leontieff, *The Structure of American Economy, 1919-39* (Oxford University Press, 1951). Wassily Leontieff *et al., Studies in the Structure of the American Economy* (Oxford University Press, 1953).

2. F. V. Waugh, "The Minimum-Cost Dairy Feed", *Journal of Farm Economics*, Vol. 33, August, 1951.

3. A detailed treatment of the budgeting procedure is in L. A. Bradford and G. L. Johnson, *Farm Management Analysis* (John Wiley & Sons, New York, 1953).

man labour supply (owner-operator and permanent hired man) and the above pasture. To simplify the problem I have assumed that the owner-operator possesses "sufficient" capital and that a decision has already been made to grow 20 acres of potatoes. It is hoped that this simple example will make evident that the linear programming technique can handle more realistic and more complicated situations. For example, the problem could have been defined so that capital, in addition to labour and pasture, was a scarce resource and the area of choice widened to include a cropping programme for the 20 acres of arable land. The labour not used in potato growing is available for the livestock programme. The problem faced by the producer is that of choosing a livestock plan that will best use the available resources of labour and pasture. The sense in which "best" is used in this context will be defined later in the example.

The livestock enterprises which are considered are:

E_1. Fine wool ewes. It is assumed that ewes are replaced every five years from the producer's own flock. The lambing percentage is assumed at 80 per cent, with a 50 : 50 sex composition. Wether lambs are assumed sold as small export lambs about four months old and the ewe lambs not required for replacement are sold as weaners about 10 months old.

E_2. Fine wool wethers. It is assumed that wethers are replaced every three years and replacements are bought. An alternative definition of enterprises 1 and 2 would have been for wether replacements for E_2 to have come from the ewe flock. In such a case it would have been necessary to assume that the replacement wethers were "bought" from the first enterprise.[4]

E_3. Crossbred ewes for fat lamb production. It is assumed that ewes are replaced every five years and replacements are bought as ewe weaners and that the lambing percentage is 95 per cent.

E_4. Dairy herd. It is assumed that replacements are from the producer's own herd and that excess heifers not required for replacement are sold as mated heifers. It is assumed that the calving percentage is 90 per cent with a 50 : 50 sex ratio and that cows are replaced every four years.

E_5. Beef herd. It is assumed that replacements are from the producer's own herd and that cows are replaced every five years. The calving percentage is assumed at 90 per cent with a 50 : 50 sex ratio.

The above list of enterprises is by no means exhaustive, but they are believed to be commonly found in the south-east.

The labour requirements for the 20 acres of potatoes and the labour available for the livestock enterprises are given in Table I. The estimates prepared in this table and in Tables II and III are based on the judgment of people familiar with the enterprises considered in the

4. For a similar procedure see Earl R. Swanson and Kirk Fox. "The Selection of Livestock Enterprises by Activity Analysis", *Journal of Farm Economics*, Vol. XXXVI, Feb., 1954.

south-east. Actual experimental data would be an obvious improvement. For a two-man labour supply, a total of 400 hours per month is assumed available.

TABLE I

Period	Potato Requirements (hours)	Labour Available for Livestock (hours)
January	33	367
February	21	379
March	21	379
April	130	270
May	43	357
June	25	375
July	24	376
August	0	400
September	47	353
October	63	337
November	12	388
December	45	355

The labour requirements at the most important times of the year for the enterprises considered are given in Table II.

The pasture requirements in grazing days per quarter and the total grazing available by quarters are shown in Table III. The derivation of the coefficients in this table is shown in Appendix A. Briefly, the total grazing available is based on carrying capacity, in terms of dry sheep, at each of the four quarters of the year. For example, in the December-March quarter the 320 acres of perennial rye-sub. clover has an estimated carrying capacity of $3\frac{3}{4}$ dry sheep per acre. The comparable figure for the 200 acres of top-dressed sub. clover was estimated at $2\frac{1}{2}$ dry sheep per acre. In terms of grazing days per quarter of ninety-one days the total grazing available is $(3{\cdot}75 \times 320 \times 91) + (2{\cdot}5 \times 200 \times 91)$ or 154,700 grazing days.

A detailed treatment of the various types of output from each of the five enterprises is given in Appendix B. By assuming a set of prices, shown in Table VIII, the revenue produced per animal was obtained. These figures are given in Table IV.

The producer has to choose a farm plan which will "best" use the available resources of labour and pasture. "Best" is used in the sense of that plan which maximizes the income given in equation 1, the coefficients in which are derived from Table IV.

1. $142{\cdot}3x_1 + 104{\cdot}3x_2 + 147{\cdot}5x_3 + 1{,}448{\cdot}3x_4 + 653{\cdot}7x_5$

Where x_1 is the number of breeding ewes in E_1
x_2 is the number of wethers in E_2
x_3 is the number of breeding ewes in E_3
x_4 is the number of mature cows in E_4
x_5 is the number of mature cows in E_5

Apart from the deduction of the cost of replacements in E_2 and E_3, equation 1 represents a total revenue equation. It would be possible to construct a net revenue equation, either by using net prices of output

TABLE II

Enterprise	Operation	Month	Hours/animal for indicated month
Fine wool ewes	Lambing, Tailing, Marking	July	·14
	" " "	August	·14
	Crutching	September	·045
	"	May	·090
	Foot rotting	August	·27
	Shearing	November	·369
	Dipping	December	·03
Fine wool wethers	Inspection	July	·02
	"	August	·02
	Crutching	September	·045
	"	May	·090
	Foot rotting	August	·27
	Shearing	November	·360[5]
	Dipping	December	·03
Cross bred ewes	Lambing, Tailing, Marking	July	·147
	" " "	August	·098
	Crutching	May	·104
	"	July	·054
	"	November	·054
	Foot rotting	August	·324
	Shearing	December	·432
	Dipping	January	·036
Dairy herd	Calving	May	·56
	Hand-feeding	June	·386
	"	July	·386
	Milking	January-August	4·01
	"	September-December	4·67
Beef herd	Calving	July	·68
	"	August	·68
	Hand feeding	July	·09
	"	August	·09
	"	September	·09
	Marking	October	·36
	Weaning	November	·18
	Inspection, culling	December	·24

TABLE III

Period	Grazing Requirements (Days per animal, in dry sheep equivalents)					Total Grazing Available (Grazing Days)
	Fine wool ewes	Fine wool wethers	Cross bred ewes	Dairy cows	Beef cows	
Mid Dec.-Mid March ..	100	91	91	1,178	1,109	154,700
Mid March-Mid June ..	100	91	100	932	1,037	154,700
Mid June-Mid Sept. ..	100	91	105	932	1,037	95,500
Mid Sept.-Mid December	115	91	119	1,014	1,109	368,550

5. Ewe lambs not required for replacement in enterprise 1 are sold as weaners and will be shorn before sale. The shearing figure for ewes has been increased above the comparable figure for wethers since mating ewes will have associated ewe weaners.

TABLE IV

Enterprise	Revenue produced/animal
Fine wool ewes	142·3/-
Fine wool wethers	104·3/-
Crossbred ewes	147·5/-
Dairy cows	1,448·3/-
Beef cows	653·7/-

or introducing the cost of inputs explicitly into the income equation. In this particular example, given that capital is not a limiting resource, it may not be inappropriate to regard the best plan as the one which maximizes the revenue function defined in equation 1. For the labour resource it is assumed that the cost of the labour input is zero. That is, that neither the owner-operator nor the permanent hired man have an opportunity to work off the farm for wages.

For the pasture resource a similar assumption is made. That is, there exists a fixed supply of pasture and the feeding of this pasture to livestock constitutes the only way of using the resource. The pasture may be grazed as such or made into hay. However, the hay produced is regarded as an intermediate input,[6] which is required only for feeding to livestock and is not an output for sale as such. Assuming hay is cut in November, the haymaking task has been estimated to require 2·25 hours of labour per ton, and it is assumed that 398 grazing days for a dry sheep is equivalent to one ton of hay. The estimated annual hay requirement for both ewes and wethers is 0·104 tons per animal and for both beef and dairy cows is 1·5 tons per animal.

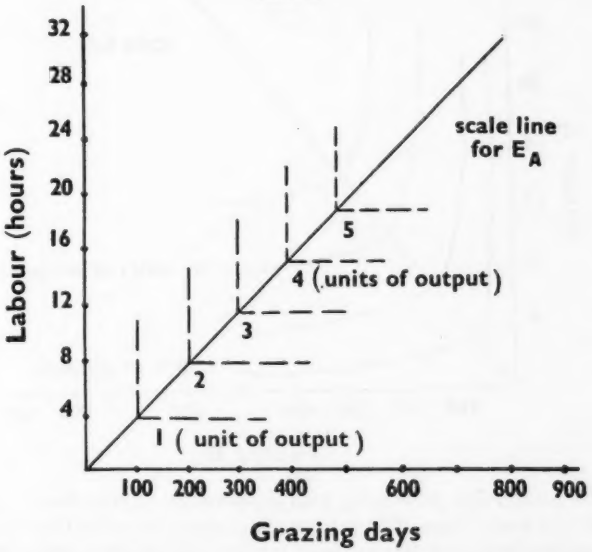
From an inspection of the pattern of farm operations for the livestock enterprises considered, it appeared possible that labour at three periods in the year would be limitational. These were the months of August, November and December. For other months of the year it seemed likely that the labour available, relative to the requirements for the enterprises considered, would not be limitational. In principle, each of the twelve months of labour could have been considered as limitational. Such a procedure would have increased the number of restraints (equations 2-9) and would have increased the computational burden. All pasture periods appeared likely to be limitational.

A geometric presentation of some of the basic ideas of linear programming in terms of this example is complicated by the fact that five enterprises were considered and a two dimensional picture does not suffice. Assume, however, that only two enterprises (activities) are under consideration, E_A and E_B, and the same two resources, namely labour and pasture. It will be noticed that the resource requirements

6. For treatment of the use of intermediate inputs in production see T. C. Koopmans (ed.), *Activity Analysis of Production and Allocation* (John Wiley & Sons, New York, 1951), pp. 33ff.

given in Tables II and III were constant and that they combined in fixed proportions at all levels of output. If, say, four hours of labour and 100 grazing days of pasture were required per unit of output in E_A and two hours of labour and 500 grazing days of pasture were required per unit of output in E_B, then there is a linear relationship between input and output and a fixed combination of inputs at all levels of output. Linear programming derives its name from this key statement of the "production functions".

FIG. 1.

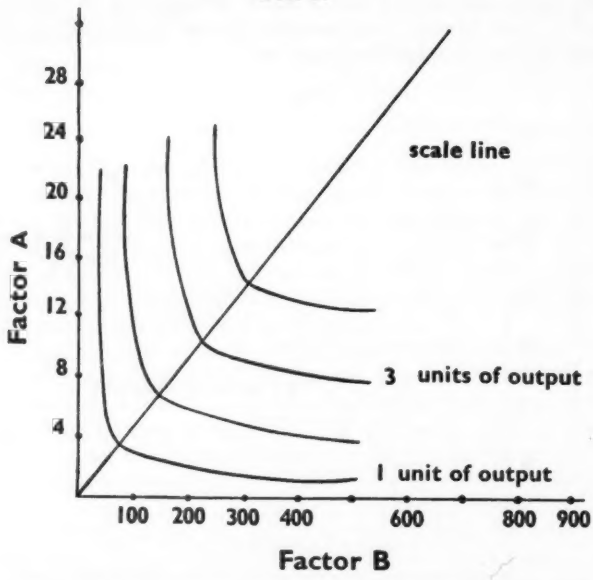


The way in which inputs combine in linear programming may be contrasted with the conventional case, where inputs admit of substitutability at diminishing rates. In Figure 1 the linear programming assumption is given and in Figure 2 the case where substitutability between inputs exists. In Figure 1 the contour map reduces to a set of points, representing a unique combination of factors for various levels of output. In Figure 2 the usual contour map for substitutable inputs is given. It is interesting to note that in Figure 2 as the prices of inputs change the least cost combination of inputs for a given level of output will change as the relatively cheaper factor is substituted for the relatively dearer one. With the fixed coefficients in Figure 1 the price ratio of factors may change without the least cost combination of factors changing.

Linear programming also assumes that both products and resource requirements are additive. That is, that total production is the sum of the units of E_A produced + the units of E_B produced. Similarly total resources requirements are the sum of the resource requirements in

each of the individual enterprises. Such an assumption of additivity precludes the existence of a complementary production relationship, although in some cases of complementarity the linear programming procedure can be modified to handle them.

FIG. 2.



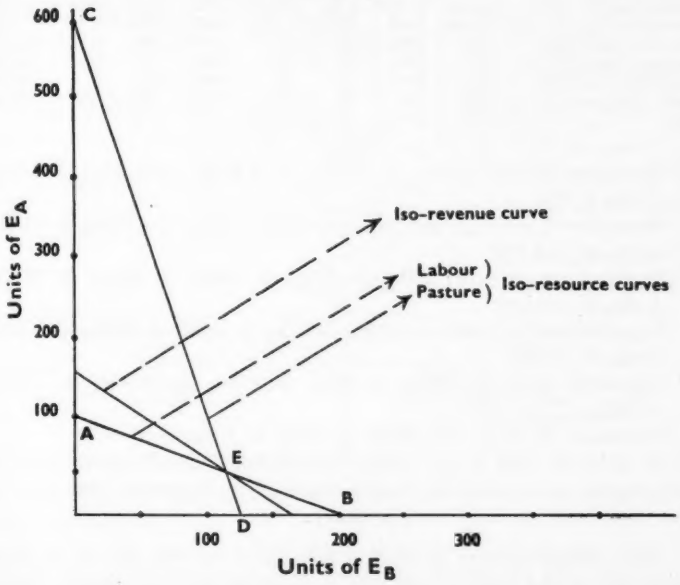
The production possibility and iso-revenue curves throw further light on the basic ideas of linear programming. Suppose that the total resources available are 400 hours of labour and 60,000 grazing days of pasture. The production possibility curves and an iso-revenue curve are shown in Figure 3.

AB shows the maximum amounts of E_A and E_B which can be produced with the 400 hours of labour available, if labour were the limiting resource. CD shows the maximum amounts of E_A and E_B which can be produced with the 60,000 grazing days available, if pasture were the limiting resource. For the two resources, the actual production possibilities are given by the line AED.

The combinations of E_A and E_B which maximize revenue will be a function of the ratio of the price of E_B to the price E_A. Five possible outcomes exist. If p_B/p_A, where p_B is the price of E_B and p_A the price of E_A, is equal to 5, the highest iso-revenue curve will coincide with ED and the producer will be indifferent between any combination of production of E_A and E_B indicated by ED. If p_B/p_A is equal to ·5, the highest iso-revenue curve coincides with AE and any combination of E_A and E_B given by AE will maximize revenue. If p_B/p_A is less than ·5, there will be no units of E_B produced and 100 units of E_A. The converse

holds if p_B/p_A is greater than 5, when 200 units of E_B will be produced and none of E_A. If p_B/p_A is greater than ·5, but less than 5, then the highest iso-revenue curve passes through E. The ratio of prices of the two outputs may fluctuate anywhere within this range without the revenue maximizing combination of E_A and E_B changing.

FIG. 3.



When more than two enterprises are considered, it is convenient to use algebraic methods. To return to the illustrative example. The problem is presented in tabular form in Table V. The numbers in the body of the table show the resource requirements per unit (e.g. one fine wool ewe, one ton of hay) and the sum of the resources used in each enterprise cannot exceed the total resources available. For example, in the case of August labour, requirements for each enterprise will be the product of the level (number of animals) and the labour needed per unit and the sum of these requirements cannot exceed the total August labour available.

Algebraically, the problem may be stated as follows: We want to maximize equation 1, subject to the restraints given in equations 2-9, the coefficients in which are derived from Table V.

2. August labour: $0{\cdot}41x_1 + 0{\cdot}29x_2 + 0{\cdot}422x_3 + 4{\cdot}01x_4 + 0{\cdot}77x_5 + 0x_6 \leqslant 400$
3. November labour: $0{\cdot}369x_1 + 0{\cdot}36x_2 + 0{\cdot}054x_3 + 4{\cdot}67x_4 + 0.18x_5 + 2{\cdot}25x_6 \leqslant 388$

TABLE V

Resource	Unit	Enterprise						Resources Available
		Fine wool ewes	Fine wool wethers	Cross bred ewes	Dairy cows	Beef cows	Hay	
August labour ..	Hours	0·41	0·29	0·422	4·01	0·77	0	400
November labour ..	Hours	0·369	0·36	0·054	4·67	0·18	2·25	388
December labour ..	Hours	0·03	0·03	0·432	4·67	0·24	0	355
Dec.-March pasture	Days	100	91	91	1,178	1,109	0	154,700
March-June pasture	Days	100	91	100	932	1,037	0	154,700
June-Sept. pasture	Days	100	91	105	932	1,037	0	95,500
Sept.-Dec. pasture	Days	115	91	119	1,014	1,109	398	368,550
Hay	Tons	0·104	0·104	0·104	1·5	1·5	−1·0	0

4. December labour: $0{\cdot}03x_1 + 0{\cdot}03x_2 + 0{\cdot}432x_3 + 4{\cdot}67x_4 + 0{\cdot}24x_5 + 0x_6 \leqslant 355$
5. December-March pasture: $100x_1 + 91x_2 + 91x_3 + 1178x_4 + 1109x_5 + 0x_6 \leqslant 154{,}700$
6. March-June pasture: $100x_1 + 91x_2 + 100x_3 + 932x_4 + 1037x_5 + 0x_6 \leqslant 154{,}700$
7. June-September pasture: $100x_1 + 91x_2 + 105x_3 + 932x_4 + 1037x_5 + 0x_6 \leqslant 95{,}500$
8. Sept.-Dec. pasture: $115x_1 + 91x_2 + 119x_3 + 1014x_4 + 1109x_5 + 398x_6 \leqslant 368{,}550$
9. $0{\cdot}104x_1 + 0{\cdot}104x_2 + 0{\cdot}104x_3 + 1{\cdot}5x_4 + 1{\cdot}5x_5 - x_6 = 0$,

where x_6 is the tons of hay made. Restriction 9 simply means that no more hay is made than is actually required for livestock feeding. The other restrictions are self-explanatory.

The computational burden is simplified by the use of disposal activities[7] in the restrictions 2-8. A disposal activity simply means letting some of the resources, labour and pasture in this case, remain unused, and zero opportunity cost has been assumed for this non-use. The actual computational procedure used in this example is the simplex technique using an artificial basis as given by A. Charnes *et al.*[8]

The maximizing solution in this case turned out to be a farm plan of 650 crossbred ewes, 132 merino ewes, 15 mature dairy cows and 104 tons of hay with income from this plan at £6,819. The resource requirements for this plan are shown in Table VI. The available re-

7. For the role of disposal activities and a simple computational example see Bernard Bowlen and Earl O. Heady, "Optimum Combinations of Competitive Crops at Particular Locations", *Research Bulletin* 426 (Iowa State College Experiment Station, Ames, Iowa, U.S., April, 1955).

8. A. Charnes, *et al.*, *An Introduction to Linear Programming* (John Wiley & Sons, New York, 1953). Not all linear programming problems require the use of the simplex procedure. For example, F. V. Waugh and G. L. Burrows, "A Short Cut to Linear Programming", *Econometrica*, Vol. 23, No. 1, 1955, and R. L. Mighell, "Alternative Methods of Programming", *Agricultural Economics Research*, Vol. VII, July, 1955 (United States Department of Agriculture). An example of the Waugh-Burrows technique using Australian data is in G. C. McFarlane and J. L. Dillon, "Linear Programming—An Example", *Rev. of Marketing and Agricultural Economics*, March, 1956.

TABLE VI

Plan	Labour Required (hours)	Pasture Required (days)
650 crossbred ewes	274.3 August 35.1 November 280.8 December	59,150 December-March 65,000 March-June 68,250 June-September 77,350 September-December
132 fine wool ewes	54.1 August 48.7 November 4.0 December	13,200 December-March 13,200 March-June 13,200 June-September 15,180 September-December
15 dairy cows	60.2 August 70.1 November 70.1 December	17,670 December-March 13,980 March-June 13,980 June-September 15,210 September-December
104 tons hay	234.0 November	41,392 September-December

TABLE VII

Unutilized Labour (hours)	Unutilized Pasture (days)
11 August	64,680 December-March
0 November	62,520 March-June
	70 June-September
0 December	219,418 September-December

sources of labour and pasture which are not utilized by this plan are shown in Table VII.

It will be noted in this plan that the limiting resources are November and December labour and June-September pasture.[9]

It is hoped that the above simplified problem will have illustrated some of the basic ideas of linear programming. The application to a farm problem should indicate the possibilities of the procedure in some areas of agricultural policy as well as in the area of farm management. For example, closer settlement decisions in Australia often are based on concepts of a farm size and a farm programme which will result in the "best" use of farm labour and will return an "adequate" income. Clearly, linear programming is a relevant technique in this context. At the individual farm level, the pattern of resource use with the five enterprises considered here may well suggest other enterprises with a pattern of resource requirements throughout the year which will result in resources available at other times in the year being utilized.

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9. The June-September pasture is not wholly utilized, but the 70 days available would not carry an additional animal for the whole quarter.

APPENDIX A

Earlier the total grazing available for the December-March quarter was derived. For the March-June quarter the carrying capacity, in terms of dry sheep, for each of the two types of pasture was estimated as equal to that of the December-March quarter. The total grazing available in the March-June quarter is then 154,700 grazing days. In the June-September quarter, given the hay feeding rates assumed, the carrying capacity of the perennial rye-sub. clover pasture was estimated at 2½ dry sheep per acre while the comparable figure for the 200 acres of top-dressed sub. clover was 1¼ dry sheep per acre. The total grazing in this quarter was then (320 x 2·5 x 91) + (200 x 1·25 x 91) or approximately 95,500 grazing days. For the September-December quarter the appropriate carrying capacities were estimated at 8¾ dry sheep for the perennial rye pasture and 6¼ dry sheep for the top-dressed sub. clover. Total grazing in this quarter is then (320 x 8·75 x 91) + (200 x 6·25 x 91), or approximately 368,550 grazing days.

The grazing requirements per animal are expressed in terms of days of grazing for dry sheep. For example, a fine wool wether carried on pasture would require 91 days grazing per quarter. The grazing requirements for fine wool ewes in the March-June and the June-September quarter have been raised to 100 on the basis that in the former quarter a ewe would be half-way through pregnancy and in the latter quarter would be suckling a lamb. In December-March there will be carried a number of ewe weaners in excess of replacements. Given the lambing percentages and the sex composition and replacement figures assumed for E_4 then, of the 80 per cent lambs dropped, 50 per cent will be sold as wether lambs, 25 per cent of ewe lambs will be kept as replacements and 25 per cent sold as ewe weaners. Assuming a ewe weaner is equal to 0·5 dry sheep,[10] then each original breeding ewe will require 91 x 1·10 grazing days per quarter or approximately 100. In September-December, 40 per cent of the original flock of breeding ewes will be carried on pasture for one month as wether weaners, so that the total requirements per breeding ewe in this quarter will be (91 x 1·2) + (30 x 0·5 x 0·4), or approximately 115. Similar adjustments for the grazing requirements of crossbred ewes were made.

Each mature dairy cow on the basis of one dairy cow equals eight dry sheep would require 728 grazing days per quarter. On the basis of a calf drop of 90 per cent, and the assumed replacement and sex composition figures, then 45 per cent of the original number of cows will be carried as mated heifers during the December-March period and an additional 45 per cent of the original number of mature cows will be carried as heifer calves approximately eight months old. Taking mated heifers as six dry sheep and heifer calves as five dry sheep then each mature cow and associated mated heifers and calves will require 728 + (6/8 x 0·45) 728 + (5/8 x 0·45) 728, or approximately 1,178 grazing days per quarter during the December-March period. In the March-June period there will be carried in addition to the mature cows, 45 per cent of the original number of cows as heifers approximately one month old. These latter are assumed to have little impact on the pasture available until the September-December quarter. Each mature cow and associated heifers will now require 728 + (5/8 x 0·45) 728, or approximately 932 grazing days. The requirements in the June September period will also be 932 grazing days. In the September-December period there will be carried, in addition to the mature cows, 45 per cent of the original number of cows as mated heifers and 45 per cent of the original number of cows as heifer calves approximately five months old (assumed equal to two dry sheep). Each mature cow and associated heifers will require 728 + (5/8 x 0·45) 728 + (2/8 x 0·45) 728, or approximately 1,014 grazing days in this period.

Each mature beef cow, on the basis of one beef cow equals seven dry sheep, would require 631 grazing days per quarter. On the basis of a calf drop of 90 per cent and the assumed sex composition and replacement figures there will be carried,

10. The conversion factors for animals other than sheep are taken from P. S. Lang, *et. al.* "Carrying Capacity: Grazing Lands", *The Valuer*, Vol. XIII, No. 8, October, 1955.

in addition to mature cows, in the December-March quarter, 90 per cent of the number of mature cows as calves approximately six months old and 70 per cent of the number of mature cows as cattle approximately 16 months old. Using two dry sheep for the former and five dry sheep for the latter the grazing days per mature cow and associated animals will be $631 + (0{\cdot}9 \times 2/7)\ 631 + (0{\cdot}7 \times 5/7)\ 631$, or approximately 1,109 grazing days. In the March-June quarter the pasture will carry the mature cows and 90 per cent of the number of mature cows as calves approximately nine months old. The sixteen-month-old animals will have been sold by the beginning of this quarter. The grazing requirements per mature cow and associated calves will be $631 + (0{\cdot}9 \times 5/7)\ 631$, or approximately 1,037 grazing days in this quarter. In the June-September period the pasture will be carrying mature cows, 90 per cent of the number of mature cows as animals approximately twelve months old and 90 per cent of the number of mature cows as calves approximately one month old. These latter are assumed to have no impact on the pasture in this period, so that the grazing requirements will be approximately 1,037 days as for the March-June quarter. In the September-December period the pasture will be carrying mature cows, 20 per cent of the number of mature cows as mated heifers for replacement of the culled cows in December, 70 per cent of the number of mature cows as animals approximately three-four months old on pasture for about one month. The mated heifers are assessed at six dry sheep equivalents. The grazing requirements per mature cow and associated animals in this quarter will be $631 + (6/7 \times 0{\cdot}2)\ 631 + (5/7 \times 0{\cdot}7)\ 631 + (2/7 \times 0{\cdot}9)\ \frac{631}{3}$ or approximately 1,109 grazing days.

APPENDIX B

For fine wool ewes, the flock will yield income from the sale of wool, wether lambs, ewe weaners and culled ewes. For fine wool wethers, sales will be wool and culled wethers. For crossbred ewes, sales will be fat lambs, wool and culled ewes. In the case of the dairy herd income will be received from the sale of whole milk, bull calves, mated heifers and culled cows. For the beef herd, sales will consist of beef and culled cows. The set of prices assumed for each type of output is shown in Table VIII. Obviously, any expected set of prices could be used.

TABLE VIII

Fine wool ewes	Good greasy merino wool	98d./ lb.
	Wether lambs	55/- per head
	Ewe weaners	66/- „ „
	Good lambs wool	76d./ lb.
	Culled ewes	20/- per head
Fine wool wethers	Good greasy merino wool	98d./ lb.
	Culled wethers	30/- per head
Crossbred ewes	Medium crossbred wool	70d./ lb.
	Culled ewes	25/- per head
	Fat lambs (77% of lambs dropped)	80/- „ „
	„ „ (23% „ „ „)	65/- „ „
Dairy heard	Butter fat	4.3/- lb.
	Bull calves	157.8/- per head
	Culled cows	485/- „ „
	Mated heifers	1,120/- „ „
Beef herd	Steers (50% of calves dropped)	826/- per head
	Heifers (28% „ „ „)	740/- „ „
	Culled cows	485/- „ „

The final prices used were determined in the following manner. Assuming each fine wool ewe cuts 12 lb. of wool and each ewe weaner 2 lb. then, given the lambing percentage, the replacement rate and the sex composition figures assumed for E_4, the income produced per ewe will be (12 x 98d.) + (55/- x 0·40) + (76d. x 2 x 0·4) + (66/- x 0·2) + (20/- x 0·2) or 142·3/-. Assuming each fine wool wether cuts 14 lb. of wool and using the replacement figure, the income produced per wether will be (98d. x 14) + ($\frac{1}{3}$ x 30) or 124·3/-. For E_2, it was assumed that replacement wethers were bought. Assuming wether replacements cost 60/- the income produced per wether, net of replacement cost, is (124·3/-) — $\frac{1}{3}$ (60/-) or 104·3/-. In the case of crossbred ewes, some lambs (77 per cent) are assumed sold at top export prices and the rest (23 per cent) slightly lower. Each ewe is assumed to cut 14 lb. of wool and ewe replacements to cost 60/- per head. The income produced per ewe, net of replacement cost, will be (14 x 70d.) + (0·7315 x 80/-) + (0·2185 x 65/-) + (0·2 x 25/-) — (0·2 x 60/-) or 147·5/-. For the dairy herd, assuming the average butter fat production per cow is 240 lb. and the calving, sex composition and replacement figures for E_4, the income produced per cow will be (240 x 4·3/-) + (157·8/- x 0·45) + (1120/- x 0·2) + (485/- x 0·25) or 1448·3/-. For the beef enterprise, given the calving, sex composition and replacement figures for E_5, the income produced per beef cow will be (826/- x 0·45) + (740/- x 0·25) + (485/- x 0·2) or 653·7/-.

OVERSEAS BORROWING—THE NEW MODEL*

1. *Introduction*

The decade since the end of World War II has brought a much more substantial revival of international investment than most economists had expected. Australia has been one of the main importers of capital, her imports being comparable in scale to the great inflows of the eighteen-eighties and nineteen-twenties. The international movement of capital of the past decade, however, and Australia's imports of capital in particular, have been very different in important respects from most past experience.

First, Australia's nineteenth-century and inter-war capital imports were predominantly portfolio investment, mainly government borrowing through overseas loan issues. Most of the recent inflow has taken the form of direct investment by overseas companies in branches or subsidiaries. Secondly, while such direct investment has always played some part in international investment, it was in earlier periods characteristically investment in extractive export industries, agriculture and mining. In the statistics of post-war American direct investment, about half is classified as in primary industries; but almost the whole of this has been oil investment; most of the other half, and much the greater part of overseas direct investment in Australia, has been in manufacturing industries. Thirdly, the economic climate in which this investment has occurred has been one of almost continuous inflation. Association between high capital imports and boom has long been familiar, and is no accident. But there is reason to believe that we are living in no mere transient boom of the old type, that acceptance of the full employment objective is likely to make some degree of inflation an almost chronic state of affairs henceforth.

It seems to me that these three features of the New Model overseas borrowing require a reconsideration of some of the traditional analysis of international capital movements, their costs and benefits to the borrowing country and their effects on internal and external balance. Such reconsideration will not answer any of the policy problems in this field which have been raised from time to time in Australia in recent years. But it may help to clarify some of the issues which policy judgments must take into the reckoning.

I propose to begin with some facts and figures about the post-war inflow of capital into Australia, then to discuss in general terms the likely economic effects of this type of inflow, and to wind up by raising one or two policy questions.[1]

* Presidential Address to the Canberra Branch of the Economic Society.

1. In preparing this paper, I have greatly benefited from reading the following four contributions to recent discussion of overseas investment in Australia: E. T. Penrose, "Foreign Investment and the Growth of the Firm", *Economic Journal*, June, 1956; R. Whitelaw, lecture on Australia's Balance of Payments Position at Canberra University College, July, 1956; P. C. Harris, *Overseas Investment in Australia since 1945*, honours thesis (unpublished), University of Queensland, November 1955; R. J. Cameron, "Benefits and Costs of Overseas Borrowing", unpublished paper, Canberra, 1956.

2. *Fact and Figures*

Overseas investment in Australian companies (including reinvestment of undistributed profits) amounted to £36 m. in 1947-8, the first post-war year for which detailed figures are available.[2] The annual inflow rose steadily to £87 m. in 1951-2 and, after a sharp dip following the 1952 recession, to £94 m. in 1954-5, the last year for which figures have so far been published. The total inflow over the eight years was £484 m., equal to about 22 per cent of Australian gross private investment in fixed equipment (other than housing and motor vehicles). On the average, therefore, we can say that direct overseas investment has financed one-fifth of the category of investment to which it has mainly contributed. Because of the post-recession ups and downs, it is hard to know how much significance attaches to the fact that this percentage was a good deal higher in the first half of the period (25 per cent) than in the second half (16 per cent).

Of the total of £484 m., about one-third came from reinvestment of undistributed profits accruing to overseas investors; only two-thirds represented new capital inflow. While undistributed profits increased steadily from year to year (except in 1952-3), new capital inflow has fluctuated very widely. But there was undoubtedly a trend for the share of undistributed profits in the total to increase over the period.

The movement in the shares of new capital and undistributed profits must be viewed in relation to the relatives shares of American (including a little Canadian) and British (including a little New Zealand and other) capital in the total.[3] Of the total of £484 m., 27 per cent has come from the U.S.A., 73 per cent from the U.K. While the rate of American investment has fluctuated more than that of British, the American share increased over the period from under 20 per cent to over 40 per cent of the total. The tendency of American companies to retain a much larger proportion of profits for reinvestment, particularly in the early stages, has meant that American investment accounted for nearly half (47 per cent) of the total of undistributed profits, but for only 17 per cent of the inflow of new capital. I shall revert presently to this important difference between the policies of British and American companies.

About the directions of this direct investment we have no precise information, no industry classification being as yet available. But it is clear from the qualitative data collected by the Commonwealth Department of National Development, and indeed common knowledge, that the bulk of direct investment has occurred in the newer manufacturing industries, especially motor car, electrical and other engineering, oil refining and other chemical industries, rayon and nylon, food and

2. All Australian statistics are taken from the Commonwealth Statistician's *The Australian Balance of Payments, Survey of Companies with Overseas Affiliations,* and the *National Income* White Paper. Some of them have been used in the form conveniently processed by Dr. Whitelaw and Mr. Cameron.

3. Hereafter, American will be used for "American including a little Canadian" and British for "British and other".

tobacco processing.[4] Outside manufacturing, the only fields that have attracted substantial overseas capital are oil search and non-ferrous mining.

Direct investment has so much dominated the scene in public attention that it comes as something of a surprise to find that it has accounted for only about 60 per cent of the total capital inflow into Australia during the period 1947-8—1954-5. Of the remaining 40 per cent, only a negligible fraction has been public borrowing—new borrowing abroad by the Commonwealth Government, from the International Bank and two small Swiss and Canadian loans, in the second half of the period only just exceeded repatriation of overseas debt during the first half (£64 m. as compared with £60 m.). Almost the whole of the inflow other than recorded direct investment appears in the balance of payments as the balancing item, "unidentified capital movements". Over the years 1947-8—1954-5, this accounted for £339 m., as compared with the total inflow of £800 m. (and £470 m. net direct investment, allowing for Australian direct investment abroad).

There are reasons to believe that, chiefly owing to slight overvaluation of imports in the trade statistics, the balancing item may have overstated the unidentified capital inflow a little.[5] But the great bulk of it reflects the large inflow of hot money in the years 1948-52 which was never reversed by a corresponding outflow when expectations of an appreciation of the Australian pound died down. What exactly happened to the hot money that cooled down we do not know. Most of it probably found its way into bonds, shares or investments through various financial intermediaries. It is safe to regard most of it as private portfolio investment in Australia which has certainly helped to supplement foreign exchange receipts and domestic saving though we cannot say much else about it. If we include this amount, the total inflow over the period of £800 m. was equivalent to 10·2 per cent of (private and public) gross investment in Australia (including increases in non-farm stocks but neglecting changes in farm stocks), though the percentage varied greatly from year to year (it was 28·3 per cent in 1949-50, 0·3 per cent in 1952-3). We can say, therefore, that overseas capital has added an extra 10 per cent to domestic Australian saving for the finance of capital development. Expressed as a percentage of cumulated national income over the period, the inflow represented 3·4 per cent, as compared with a corresponding figure for the nineteen-twenties (1922-3—1929-30) of 4.8 per cent.[6]

Since much of the later discussion will have to concern itself with the interest burden of this overseas debt, some of the facts on this aspect should also be given. Over the whole period 1947-8—1954-5, total profits accruing to overseas investors on direct investment amounted to £316 m. In addition, Australia paid £161 m. interest on public overseas

4. See also D. M. Hocking's 1955 ANZAAS paper and P. C. Harris, *op. cit.*
5. I owe this point to Dr. R. Whitelaw.
6. The figure for the 1920's is derived from Clark and Crawford's national income data and Dr. Roland Wilson's estimates of capital imports; it may not be entirely comparable to the post-war figure.

debt and £57 m. "other interest" on portfolio investment, including presumably the new capital that originally came in as hot money.

The total net interest burden in the post-war decade was substantially lower than it had been before the war; it averaged 2·1 per cent of national income, as compared with 5·9 per cent in the decade 1928-9—1937-8. The main reason for the decline in the burden has, of course, been the expropriation of overseas holders of Australian bonds through inflation. Public overseas debt interest, as a percentage of national income, fell from an average of 4·6 per cent in the thirties to less than 1 per cent (0·9 per cent) in the post-war years. But even private interest due abroad was a smaller percentage of national income on the average over the period (1·2 per cent post-war, compared with 1·3 per cent pre-war). But the averages, though significant, are somewhat deceptive if we are interested in the future, for they conceal the fact that, while the burden of public overseas debt interest has continued to decline so far (from 1·9 per cent in 1945-6 to 0·5 per cent in 1954-5) the burden of private profits and interest accruing to overseas investors has risen from 1·4 per cent to 1·8 per cent of national income.

Of the total profits on direct investments, 37 per cent accrued to U.S. investors, 63 per cent to U.K. investors; but the American share rose very rapidly from 19 per cent in 1947-8 to 51 per cent in 1953-4 (there was a slight fall to 44 per cent in 1954-5). These totals include undistributed as well as remitted profits. Over the period as a whole, almost exactly half the profits (49·3 per cent) were retained and reinvested, but this equal division is the accidental product of very divergent policies of American and British companies. American companies have reinvested a larger proportion throughout (64 per cent, as compared with 44 per cent for U.K.). As the American share in total profits has risen, so has the share retained (from one-third in each of the first two years to 49 per cent in 1953-4 and 52 per cent in 1954-5). The policy of American companies, well exemplified by General-Motors Holden, appears to have been to retain and reinvest almost all profits for the first few years of a project and then to settle down to a 50/50 ratio in their distribution policy.[7] The dominant influence in the case of British companies (where older investments, of course, account for a larger proportion) appears to be a policy of dividend stabilization, so that undistributed profits have fluctuated disproportionately from year to year.

As a basis for judging the magnitude of these profits, we can make a number of comparisons. We can express them as a per cent yield on overseas capital invested. The average yield over the post-war period (total profits after tax for the year as per cent of cumulated overseas investments at the beginning of the year, excluding reserves as at June 30, 1947) has fluctuated slightly around 9 per cent. Here again, the divergence between American and British investments is very striking. The U.K. average was 7·4 per cent; the U.S. average was 16·7 per cent over the period as a whole and rose from 10·6 per cent in 1947-9 to an

7. Cf. E. T. Penrose, *op. cit.*, pp. 227ff.

average of 24·3 per cent in the two years 1953-5. (The high U.S. figures owe something to the General-Motors Holden giant; but even excluding G.M.H., the yield on U.S. investments averaged 13·7 per cent, nearly twice the average U.K. yield, and reached 23·0 per cent in 1953-4.) Clearly, American capital has been very expensive, and the average yield of overseas direct investment capital has risen rapidly with the growth in the American share.

In relation to Australia's balance of payments, the two most interesting comparisons are that between profits remitted and new capital inflow (excluding undistributed profits), as an index of the net effect on the current foreign exchange position, and that between total profits and export income, as an index of the long-term strain of the debt burden on the balance of payments. Inflow of new direct investment capital over the period 1947-8—1954-5 was twice as high as distributed profits remitted abroad. But it is worth noting that in the last three years, 1952-3—1954-5, profits on dollar investments remitted abroad (£29·4 m.) very considerably exceeded the import of new dollar capital (£12·1 m.); in the year of small new inflow, 1952-3, the new inflow from all sources of £9 m. fell far short of the total profit remitted of £22·3 m. (If undistributed profits are included on both sides, we find that, over the period as a whole, two-thirds of the foreign exchange received through direct investment in Australia was required to finance dividend remittances on accumulated overeas investments.) Total profits and interest remitted abroad (on all overseas capital invested in Australia) averaged only 6 per cent of Australian export income in the post-war decade, as compared with 21 per cent in the pre-war decade. But if allowance is made for undistributed profits, which matter even to the balance of payments in the long run, the post-war average was 8·6 per cent and, what is more important, it nearly doubled in the last four years (from 6·3 per cent in 1950-1 to 11·1 per cent in 1954-5).

3. *Benefits and Costs*

So much for facts and figures. Let me now turn to theorizing. The $64,000 question, of course, is whether the sort of direct investment we have had in the post-war years is a good thing, whether its benefits to Australia outweigh its costs. I shall admit at once that I do not know the answer. Indeed, the thesis I want to argue is that a clear-cut answer is virtually impossible. Besides the direct benefits and costs of overseas direct investment in Australia which can be compared relatively easily, there are indirect benefits and costs which may be very important but are almost incapable of quantitative assessment. The trouble is that, while the benefits, even the indirect ones, accrue currently and are widely felt and appreciated, the costs are largely deferred and some of the indirect costs may not even be suspected. It is in bringing the less obvious costs and benefits to light and broadly assessing their probable weight that theoretical analysis can be of use.

I want to begin with an aspect which is sometimes brought into the discussion but which is of relatively minor importance: the effects of direct investment on short-term external and internal balance.

(a) *Short-term External and Internal Balance*

During the first post-war inflation of 1949-51, the suggestion was sometimes heard that one way of filling the gap between investment and saving would be to attract more overseas capital to Australia. Again, in the balance of payments crisis of 1955, it was argued by some that a larger inflow of overseas capital would be helpful by supplement current foreign exchange receipts. How sound or fallacious were these views?

Clearly, any capital inflow into a country, other things being equal, represents, in money terms, an addition to the country's current foreign exchange earnings and, in real terms, an addition to available market supplies. Other things (including domestic effective demand) being equal, therefore, any capital import improves the balance of payments position and, through the additional imports which it finances, exercises a deflationary (or disinflationary) effect on the level of domestic economic activity. The question is whether other things will remain equal, whether the inflow of capital will not, directly or indirectly, add to domestic demand for resources (including imports and exportables) as well as to supply.

If the question is put in this form, the answer is not really in doubt. It is very difficult to think of any forms of capital import which will not have *some* effect in raising the level of domestic spending. Almost the only example I can think of is an equilibrating capital inflow, such as a fall in international reserves or borrowing from the IMF, designed to finance an existing balance of payments deficit. Even the inflow of hot money of the years 1949-51, by increasing the liquidity of banks and other sectors of the capital market, must have given some fillip to domestic investment. Government overseas borrowing, though ostensibly designed to finance a pre-determined public works programme, almost certainly induces a higher level of domestic spending since the coat of domestic public investment tends to be cut in some measure to the cloth of available finance. Where, as in the case of the first International Bank loan, the money is deliberately spent on imports of capital goods which will widen bottlenecks in domestic production, the capital import may not merely raise public investment, but also pave the way for additional private investment which would not otherwise have been undertaken.

There is a similar range of possibilities in the case of direct investment by overseas companies. Some of this investment in post-war Australia may merely have replaced domestic investment projects. But it is probably a reasonable assumption that much of it has been additional. If General-Motors Holden, for instance, had not entered the field, there would probably have been more domestic Australian investment in the motor car industry (we must abstract here from fiscal or monetary restraints that might have been imposed on such investment); but total investment in the Australian motor car industry has surely been much larger, thanks to G.-M.H. and other overseas investments, than it otherwise would have been. Australian experience, moreover, suggests that

overseas direct investment in new industries, while perhaps in some degree inhibiting domestic investment in these industries, often has the effect of stimulating domestic investment in complementary industries supplying materials, parts or products in joint demand, providing retail outlets, or exploiting new techniques in other directions.

There is little doubt in my mind that direct overseas investment tends to make a substantial net addition to the level of domestic spending, probably more so than all other forms of overseas borrowing. The question, then, is whether this addition to demand is likely to be greater or smaller than the capital imported.

In the most favourable case, where the capital imported by an overseas company pays for the whole of its investment expenditure and this replaces an equal amount of domestic investment that would otherwise have been undertaken, the answer is straightforward: total domestic spending remains unchanged and the favourable net effect on external and/or internal balance equals the capital imported.[8]

If the capital import finances the whole of the overseas company's investment, but this represents a net addition to domestic investment spending, the effects of the capital import on supply and demand cancel out, leaving internal and external balance unaffected at a higher level of investment and imports. (In an underemployed economy, this conclusion would need to be qualified to the extent that some of the additional income generated would be saved; in a fully employed economy, this qualification can be neglected, since most of the increase in demand quickly spills over into imports.) If, however, the import of capital causes the level of domestic spending to rise by a *larger* amount—whether because the overseas company tries to finance part of its investment by raising additional domestic capital or because the overseas investment stimulates more domestic investment (in complemen-

8. The mechanism by which the favourable net effect is achieved is the subject of familiar "transfer problem" analysis. The simplest case is where the whole overseas investment project is undertaken with imported resources. Imports increase directly by the amount of the capital import. The overseas project makes no demand on domestic resources. But this demand falls owing to the elimination of the domestic investment project. How this fall in domestic spending is distributed between domestic resources and imports depends on the direct import content of the domestic investment and the marginal propensity to import. If the initial condition of the economy was inflationary, the marginal propensity to import will be near unity; most of the fall in spending will quickly be reflected in reduced demand for imports (or exportables).

If some of the imported capital (which we may assume to have taken the form of a remittance of, say, dollars to Australia) is spent by the overseas company on domestic resources, the mechanism depends on the exchange system assumed. Under free exchanges, the remittance itself causes the £A to appreciate; with domestic spending unchanged, the import surplus resulting from the appreciation represents the net disinflationary effect (though the appreciation will be smaller, if the overseas investment has a higher import content than the domestic investment it replaces). Under a system of fixed exchanges, the capital import, with unchanged domestic spending, in the first instance merely increases international reserves; the improvement in the balance of payments position would be converted into a disinflationary effect on internal balance if it made possible relaxation of existing import restrictions or if an import surplus were brought about by deliberate appreciation of £A. Here again allowance must be made for a possible offsetting increase in import demand resulting from the replacement of domestic by overseas investment.

tary industries) than it replaces, then the net effect of the capital inflow on internal and/or external balance is almost certain to be unfavourable. Far from helping to close an existing inflationary gap or restoring balance of payments equilibrium, the inflow adds to inflationary pressure on resources (or at least to pressure on existing fiscal and monetary controls of inflation) and/or to existing balance of payments difficulties. It causes a "transfer problem in reverse".[9]

What the position has been in Australia's case in the post-war years is anybody's guess. My own view is that, in this short-run sense and ignoring its long-run effect on the national product, overseas investment has had a net inflationary effect in both the post-war booms, 1949-51 and 1954-6.

(b) *Long-term Growth of Real Income*

Any assessment of the costs and benefits to the borrowing country of investment of overseas capital must concentrate, not on the short-term effects we have so far considered, but on the long-term effects. If we abstract from non-economic considerations, such as the possible undesirability of foreign control, the criterion must be the effects of the process of overseas investment on the long-term rate of growth of the borrowing country's real national income.

Traditional theory, with its eye primarily on long-term fixed-interest portfolio investment, has tended to focus attention on what we might call the "direct" benefits and costs to the borrowing country. The borrowing country benefits from the increase in the productivity of its resources which results from the additional capital supplied from abroad. The costs are represented by the overseas debt service: interest and repayment of principal. Provided the additional real income which results from overseas borrowing exceeds the amount that has to be paid to overseas creditors in interest and amortization, there is a net gain to the borrowing country. (There is a net gain to the lending country, provided the interest rate on overseas investment exceeds the highest yield obtainable on domestic investment.) It has usually been recognized that overseas debt service confronts the borrowing country with a transfer problem. But it has generally been thought sufficient to point out that the borrowing country must ensure an adequate increase in export production to enable it to service its overseas debt.

In the case of the nineteenth-century type of government overseas borrowing, there might sometimes have been legitimate doubt as to whether the direct benefits were sufficient to cover the direct costs, since there was no direct accounting relationship between the yield of the investment in terms of additional real income and the costs of overseas debt service. In the case of private direct investment, it can be shown *a priori*, subject to relatively minor qualifications, that the direct benefits exceed the direct costs to the borrowing country.

The direct costs are simply the profits accruing to the overseas investors (since, in the case of direct investment, there is usually no

9. C. P. Kindleberger, *International Economics*, p. 354.

expectation of repayment of principal, i.e. repatriation of equity capital); and these profits come out of the increase in real income produced in the industry in which the investment is made. The profits cannot exceed the increase in real income resulting from the investment unless the investment reduces the incomes accruing to residents of the borrowing country. This is, of course, possible. Competition by the overseas firm may squeeze out, and inflict losses on, existing domestic firms; large overseas companies may achieve monopolistic positions in which they are able to exploit labour or consumers. In all these cases, moreover, what matters is not merely an absolute loss, but a loss of resident income relative to what it would have been in the absence of the overseas investment. But while such offsetting losses are possible, they are not likely to be serious. There is every reason to believe that profits accruing to overseas investors absorb only part of the benefit which accrues through higher productivity in the enterprises established by overseas capital; that a substantial part accrues to consumers in the form of better quality products (and/or lower prices), to local factors of production in the form of higher real incomes, and to governments in higher tax-revenue.

As far as the direct costs and benefits of direct investment are concerned, therefore, the issue is not really in doubt: there is almost certainly a net gain to the borrowing country. The trouble is that the matter does not end here. Direct investment, in addition, involves indirect benefits and costs which blur the issue almost irretrievably.

The indirect benefits mostly fall under the general heading of technical progress. It is a well-known advantage of direct investment over portfolio investment that it brings to the borrowing country not merely capital but also technical and managerial know-how. There is no need to dwell on the very great advantages which Australian manufacturing industries have derived in the post-war years from the introduction of overseas, and especially American, enterprise, managerial skill, techniques, methods and new products. Through the stimulus and example they give to domestic firms, through training of local labour at all levels in new skills, and through the pressure of powerful competition, the benefits of technological advance spread beyond the firms in which the overseas investment is made; they accrue as external economies to residents of the borrowing country and represent an additional net benefit which, though quite incapable of measurement, may be very substantial.

Against these indirect benefits must be set three forms of indirect or social costs of direct investment: (a) the non-economic costs, if they are so regarded, of increasing foreign control of the borrowing country's industries; (b) the economic and social costs of increased short-term difficulties in controlling inflation; and (c) the long-term economic and social costs of balance of payments adjustment to which direct investment may give rise. The first is a matter of political opinion about which I have nothing to say. The second has already been discussed; I would regard it as an item of indirect cost but not a very

important one. It is the third, the long-term balance of payments problem, that is by far the most serious and to which we must now turn.

(c) *Long-term External Balance*

The chief item of indirect social cost in relation to long-term external balance arises from the need to find foreign exchange for the remittance of profits accruing to overseas investors. That such a transfer problem may arise is well known, but its precise nature is not always understood.

For a developing national economy to remain in long-term external balance, in the absence of international capital movements, it is necessary that exports (or more generally current receipts of foreign exchange) rise in step with imports (or more generally payments due abroad). Domestic investment must be distributed between the various sectors of the economy in such a way that the value of exports keeps in step with national income or, if not, that enough import replacement takes place to fill the gap.

Overseas investment must do more: it must have a sufficient bias towards increased export production or import replacement to ensure the long-term improvement in the balance of payments necessary to finance the transfer of dividend remittances abroad. The emergence of this problem may be postponed in two ways: either by retention and reinvestment of profits by the overseas companies themselves, or by a steady increase in new capital inflow which keeps pace with the growth in remitted profits on past investments. The former is intrinsically unlikely for any length of time; individual overseas investors will sooner rather than later want to see a return for their money. The latter is, in principle, conceivable. But for various reasons, some of which we shall consider later, it would be foolish to rely on it. Sooner or later the chickens will come home to roost. For all practical purposes, the growth in the borrowing country's dividend commitment on overseas direct investment, viewed on its own, is equivalent to the certain prospect of a long-term decline in its terms of trade.

The magnitude of the necessary bias towards export production or import replacement depends on the relative rates of growth of the profits accruing to overseas investors and the borrowing country's national income. Here Dr. Penrose has given convincing reasons to expect that, in the very nature of the overseas firms, with their technical and managerial superiority and their advantages of new products and economies of growth, their profits are likely to grow faster than the national income.[10] As the figures I quoted earlier showed, they rose during the post-war decade from 1·4 per cent to 1·8 per cent of Australian national income.

Thus far (except for the Penrose effect) the problem of debt service is common to direct and portfolio investment. Indeed, it is less for direct than for portfolio investment since repayment of principal can be neglected (though there may be difficulties of sporadic partial

10. E. T. Penrose, *op. cit.*, pp. 228f.

repatriation to which I shall revert later).[11] In the past, moreover, direct investment was, in its character, geared to solving the transfer problem going along. So long as most direct investment was in extractive export industries, plantation agriculture and mining, it had all the export bias that was needed and more.

This is no longer true of the New Model direct investment of the post-war years. Practically none of it has been in Australia's traditional export industries—none in rural industries and only a little in mining. The great bulk has been in manufacturing industries and a little in tertiary industries. (As Dr. Penrose has pointed out, the pace of investment in manufacturing may actually have retarded growth in the export industries by depriving them of capital and other productive resources,[12] although the rural industries no doubt benefit in the long run from increased productivity in manufacturing.) There can be very little doubt that the inflow of overseas capital has been a factor, perhaps a major factor, in the disproportionately rapid growth of Australia's secondary industries, relatively to her traditional export industries. This establishes a strong prima facie case for the view that post-war direct investment, far from having had the necessary bias towards export production, has helped to give post-war Australian economic development a bias *against* export production. If this is true, it would imply that overseas investment would have contributed to a long-term balance of payments problem even if it had taken the form of free gifts.

Of course, I have so far substantially overstated the point. In the first place, some of Australia's manufacturing industries may gradually develop significant export markets. Secondly, the development of these secondary industries may be contributing towards long-term external balance through import replacement. This is a matter which has been much discussed recently[13] and on which I do not want to spend time. All I need to say is that I am not as sceptical as some about the possibilities of import replacement in the long run. If Australia is to follow in America's footsteps and develop from a primary producing and exporting into an industrial economy, this is the transformation in the pattern of her trade that must occur in the long run. But I think it would be optimistic to hope that these two factors will, for some years

11. The difference between portfolio and direct investment, in that the former does and the latter does not involve an obligation to repay the principal, is in any case more legal than economic. If the yield of portfolio investment must cover amortization, so the yield of direct investment must cover depreciation. And while direct investors are unlikely in normal circumstances to repatriate the equity capital they have acquired, it is also true that little public overseas debt has in practice been repaid in normal circumstances. Debtor Governments have tended to convert maturing overseas debt, much like domestic national debt. Reduction in international debt has in modern history, with few exceptions, occurred only through default, inflation or the opportunities afforded by war conditions.

12. *Ibid.*, p. 232 nl.

13. (C. D. Kemp), "The Import Replacement Theory", *IPA Review*, Melbourne, Oct.-Dec., 1955; R. J. Familton, "The 'Import Substitution Thesis", paper presented to Section G of ANZAAS, Dunedin, 1957.

yet, offset (let alone outweigh) the disequilibrating bias of large-scale investment in manufacturing industries.

A third, more esoteric, point which may be thrown into the scales in favour of the New Model direct investment is the converse of a traditional objection to the old type of overseas investment in primary industries. It used to be said that such investment tends to turn the terms of trade against the borrowing countries. On the same reasoning, the New Model investment might be expected to have a modest effect in improving Australia's long-term of trade. But this is true of almost any domestic structural change which worsens a country's balance of payments.

We must conclude, therefore, that direct investment of the post-war type is very likely to give rise to a long-run balance of payments problem because, while the transfer of remitted profits to overseas investors requires a long-run bias in the structure of the economy towards export production (or import replacement), the structural effects of this investment have so far, if anything, been in the opposite direction. It is reasonable to regard this as an indirect social cost of overseas investment since it will sooner or later require socially and economically costly measures of balance of payments adjustment; they may be the costs, in terms of productivity, of quantitative import restrictions, or the social costs of currency depreciation in terms of its effects on internal balance, income distribution and necessary shifts of resources, or the similar social costs of alternative measures. Unfortunately for the formulation of a rational policy on overseas investment, it is quite impossible to assess the likely magnitude of these costs; but the very fact that they lie in an uncertain future should put us on our guard against discounting them too generously.

To give just one highly speculative quantitative illustration. Between 1948-9 and 1954-5, the ratio of profits on U.S. direct investments in Australia to Australian national income rose from 0·24 per cent to 0·71 per cent; the corresponding ratio for U.K. investment from 0·72 per cent to 0·89 per cent. If both ratios maintained their rates of growth to 1965, total profits accruing overseas would in 1965 represent 6·3 per cent of Australian national income (U.S. 5 per cent, U.K. 1·3 per cent). Assuming Australian exports remain at about a quarter of national income, the 1965 profits accruing overseas would represent 25 per cent of Australian export income; by 1969, this ratio would overtake the average for the nineteen-thirties of 34 per cent. It is easy to make one's flesh creep with such crude extrapolations. But they should be examined critically, not simply ignored.

Apart from the transfer problem, there is a second indirect cost of overseas investment relating to long-term external balance which we must take into account. It is arguable that a high rate of overseas borrowing increases the social costs arising from instability in the balance of payments.

It used to be a commonplace that a large overseas debt exposes the debtor country to special risks of balance of payments trouble in the

event of a slump in its export prices and earnings. Australia's inflexible interest commitments abroad represented one of the most serious aspects of the slump of 1929-30. It therefore used to be thought an important advantage of direct over portfolio investment that a slump automatically reduced the volume of profits payable abroad.

More recently it has been pointed out that this argument in favour of direct investment has lost some of its weight with the prospect that disastrous slumps and depressions of the 1930-33 type may be a thing of the past.[14] (Chronic inflation is likely to yield chronic boom profits, though if inflation in Australia is not paralleled by inflation elsewhere these profits are likely to be impaired from time to time by currency depreciation.) The force of the argument is further diminished if, as in post-war Australia, overseas investment is concentrated in secondary industries producing for the home market; for their profits will not be as sensitive to fluctuations in export earnings as were the profits on the old-type direct investments in export industries. Still, the fact that, despite a huge inflow in the preceding year, Australian profits accruing overseas remained constant in the recession year 1952-3 suggests that there is still something in this point in favour of direct over portfolio investment.

There is, however, a second more serious threat to balance of payments instability to which the New Model overseas borrowing is no more immune than nineteenth-century borrowing by overseas loan issues: the danger of sharp cyclical or other fluctuations in the rate of net inflow of new capital, including the possibility of repatriation of past investments. (Direct investment has a steadily growing base in reinvested undistributed profits; but these do not in any case affect the short-term balance of payments.) In the Great Depression, the sudden cessation of American investment overseas was as serious a cause of balance of payments trouble in the rest of the world as the slump in American imports.

Here again, the prospect that we may be able to avoid serious slumps and depressions in future also promises to reduce the risk of drastic cyclical fluctuations in the rate of inflow of overseas capital. As I pointed out earlier, inflow of new capital (excluding undistributed profits) fell from £62 m. in 1951-2 to £9 m. in 1952-3, the product of a fall in U.K. investments from £43 m. to £20 m. and an actual outflow of U.S. capital of £10 m. The combined effect of the relative inflexibility of profits due abroad (particularly, because of dividend stabilization, of remitted profits) and the sharp fall in new capital inflow was that an excess of new capital inflow over dividend remittances of £46 m. in 1951-2 turned into an excess of profits remitted over new capital inflow of £13 m. in 1952-3.

These are still relatively puny figures compared with the huge swings in Australia's export earnings. But they will grow if new capital keeps step with the rapid growth in profits due overseas, and the ups and downs may come at the most awkward times. I am not unduly

14. E. T. Penrose, *op. cit.*, p. 231.

concerned about this aspect of overseas investment. But it cannot be left out of the reckoning in assessing the social costs to the borrowing country.

4. *Conclusion*

It is time to sum up.

I have tried to show that the direct benefits to Australia of investment of overseas capital almost certainly exceed the direct costs. But there are also indirect benefits and indirect costs which are very much more difficult, indeed quite impossible, to assess. I have said very little about the indirect benefits, increased productivity through the introduction of new ideas, skills, techniques, methods, products, because they are familiar. I have devoted much of my time to analysing the indirect costs, especially those arising from long-term balance of payments problems, because they have not, I think received sufficient attention. I must therefore emphasize that the time I have spent on each in no way reflects my opinion of their relative magnitude. I think it is quite possible that the benefits, direct and indirect, of overseas investment during the past decade have greatly outweighed the costs, direct and indirect, and will continue to do so. My point is that I do not know and that I cannot see how anyone can find out. I would merely add the rider that I suspect that those who have to make the policy decisions, in common with every one else, may have been inclined to treat the indirect costs too lightly, partly because they have not been clearly recognized and partly because the bill for them will be presented in the future. But this does not greatly alter the picture. Anyone is entitled to the view that the benefits greatly outweigh the costs even when all the indirect costs have been brought fully to account.

I confess this conclusion bothers me as an economist. Here is a major issue of economic policy, yet it seems impossible to find a rational basis on which the economist can advise the policy maker. Perhaps the rational course in such a situation is to make hay while the sun shines and cross one's bridges when one comes to them. Things may turn out all right, and in the last resort, the foreign debt problem has often enough in the past been "solved" by default or moratoria or restrictions on transfer. It is arguable that this is a risk of which overseas investors are, or should be, aware and for which they can be expected to allow in their investment decisions.

The alternative course, for those who conclude that the costs of an open door policy for direct investment by overseas companies are likely to outweigh the benefits in the long run, might be to seek ways of reducing the costs, if necessary by restricting the inflow. As all the efforts of recent years to clear away obstacles to overseas investment demonstrate, it should not be difficult to give *indiscriminate* discouragement to overseas investors. But that would be throwing out the baby with the bath-water. A more sensible approach would be to see whether the costs could be limited.

Something might be done to give preferential treatment, through taxation or in other ways, to investment in export or import replacing

industries. Overseas investors might be required to grant a minimum share in the equity of new subsidiaries to local (private or public) capital. More attention might be given to the practicability of devices, such as management contracts, by which overseas technical know-how might be obtained without overseas capital and the dividend commitment limited in time. The corollary would be to obtain overseas capital, as far as possible, in the cheaper form of fixed-interest capital through Government or even corporate bond issues.

I do not want to elaborate these very unoriginal suggestions, if only because I am not sure whether anything of the sort needs doing at all. But if anyone, after examining my arguments, should come to the conclusion that a revision of Australian policy on overseas investment would be desirable, these, I think are the sorts of measure he should give his consideration.

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COMMENT

In view of the importance of this topic, the following comments on one or two of the points made by Professor Arndt may be of some interest.

The general case for expecting direct investment from overseas to raise national income by a greater amount than its own profit seems to me so strong that only in very exceptional circumstances indeed would the contrary be true. The new venture must attract labour and materials and compete with existing supplies, domestic or imported, for a market. In each instance it tends to raise the real income of wage earners, suppliers, or consumers, thus distributing part of the increase in production. It also must pay taxes. This distributed increment of production could be exceeded by the loss inflicted on a displaced domestic producer in circumstances conceivable, but extremely improbable, given the maintenance of full employment, which is surely the appropriate assumption in discussing Australian experience since the war.

Although Professor Arndt deprecates their importance, he does adduce two circumstances in which profits may exceed the increment of production. It seems to me that his argument fails in each case. The first is where overseas capital inflicts losses on competing domestic firms. This has already been mentioned; surely in most circumstances there would be a correspondingly great offsetting gain to consumers, by reason of the price reduction or improvement in quality.

Secondly, "large overseas companies may achieve monopolistic positions in which they are able to exploit labour or consumers". In circumstances where it is appropriate to confine our attention to domestic producers, in my view the argument should be turned completely around; surely the situation is one of an increased degree of competition in the industry, listed by Professor Arndt as an indirect benefit of foreign investment. As for labour, the argument could apply only in

isolated localities where alternative employment is lacking; even here, there is the influence of trade unions and industrial tribunals to be reckoned with. Where the market concerned is supplied partly from imports and partly by domestic producers, will not the availability of imports prevent monopoly profits, even should domestic capital be driven from the field once and for all? It seems to me, if I may be permitted a digression from Professor Arndt's paper, that most of those who fear that the entry of subsidiaries of large foreign companies will aggravate the degree of concentration in Australian industry overlook that these subsidiaries may in time widen their fields of interest to compete with established producers in monopolistic positions, if they are not already doing so, and they forget that for many commodities the market is divided between domestic producers and imports. The concern occasionally expressed at the growth of the Holden's share of new car sales might more appropriately have been directed at the merger of the Austin and Morris interests.

The only aspect of overseas borrowing about which Professor Arndt expresses serious concern is that it gives rise to a long-run transfer problem of a kind not encountered in the nineteenth century. Overseas investment in Australia is now mainly direct rather than portfolio investment and the direct investment is mainly in manufacturing rather than in the rural industries whose products, in primary or processed form, comprise most Australian exports. Professor Arndt therefore argues that investment financed from overseas will not, taken by itself, bring about the change in the balance of payments required in order to effect dividend remittances. Consequently, other measures to effect this change will become necessary and their implementation will entail costs, which should be set against the increase in resident national income resulting from overseas investment.

I do not know whether or not for the world as a whole direct investment in the nineteenth century was more export-oriented than it is today. But with respect to a possible Australian transfer problem the relevant comparison between last century and today is between mainly government borrowing and mainly direct investment. It is commonly said that nineteenth-century Australian governments borrowed in order to build the railways and other works necessary for the production and transport of wheat and wool. There is, however, a very real difficulty involved in identifying any one expenditure item with any one receipt item in a government budget. Perhaps the works essential for export production would have been carried out even had there been no overseas borrowing.

But whatever the verdict of the economic historians on this point, it is of minor importance in comparing nineteenth century and present-day borrowing, in view of the legitimate doubts mentioned by Professor Arndt as to whether or not direct benefits exceeded direct costs in the earlier period.

Altogether apart from the validity of the historical comparison, there is a more general point that the argument about the indirect

costs of transfer seems applicable to any single influence on the economy that is not, taken by itself, neutral with respect to the balance of payments. It thereby loses much of its force. Thus one might say of practically any act of investment that it required some imports and that the necessity for a change in the allocation of resources in order to pay for these imports should, therefore, be offset against the increased output resulting. I do think that something of a bogey is raised by talking of "socially and economically costly measures of balance of payments adjustment". Is it really that difficult to arrange our economic affairs so as to make available to overseas investors their portion of the increased income resulting from their activities?

I should also like to comment on Professor Arndt's inclusion of the balancing item in the balance of payments estimates as a capital inflow, thus increasing the magnitude of the post-war increase in our overseas indebtedness by well over £300 million. The balancing item is customarily placed in the capital rather than in the current account of the balance of payments mainly because substantial variations may occur in the time elapsing between the recording of commodity flows and the making of the corresponding payments;[1] these so-called leads and lags constitute short-term capital movements. In addition, some transactions of a capital nature probably escape the Statistician's net, though judging from his publications the search for capital items appears to have been most intensive. Indeed, I wonder whether there is now any justification for distinguishing, with respect to statistical coverage, between current invisibles and capital items other than leads and lags.

In contrast with the knowledge gained of capital transactions, the valuation of exports and imports in the current account is, generally speaking, that recorded by Customs. It seems probable that export proceeds are understated. For example, it would be surprising if wool exporters took the care to record not merely the price paid at auction but every expense incurred in getting the wool on to the ship. In the case of exports on consignment, the valuation placed on them by the exporter would almost certainly tend to be conservative. As for imports, the value for duty recorded by Customs is in a number of circumstances required to exceed invoice value. Very small errors of this kind in these valuations may well account for a quite large positive balancing item year by year.

In the face of the very extensive fields explored for capital transactions and the probable errors in valuation affecting the current account, it appears that the balancing item may be a reliable indicator of leads and lags, but that the errors and omissions together responsible for a positive balancing item over the years should not be regarded as a

1. With respect to imports, see the analysis of intercompany accounts presented in Commonwealth Bureau of Census and Statistics, *Survey of Companies with Oversea Affiliations*, 1947-8 to 1954-5, Table 7, Item 1. If United Kingdom merchants and banks finance a constant proportion of Australian imports, the rise in money value would be responsible for a net positive balancing item over post-war years.

long-term capital movement. As for "hot money that cooled down", I cannot credit that £300 million of speculative funds, having failed to make the quick profit that supposedly brought them to Australia, then settled down as portfolio investment, all without leaving a scrap of producible evidence.

Whatever one's views as to the present balance of advantage from the inflow of overseas capital, the important practical question is how the cost of such capital can be kept to a minimum. With respect to private overseas capital, I suggest that a major factor raising profits earned has been the maintenance of a high, at times inflationary, level of demand within the country, with direct controls on commodity imports both protecting the exchange rate and limiting competition from imports, while permitting free remittance of profits. The implication is that an important means of limiting the cost of overseas capital is the avoiding of inflationary situations, both because of their direct effects and as a potent cause of import restrictions. The argument also applies with particular force to restrictions on the import of dollar goods. Sterling Area "savings" on direct dollar imports are accompanied by a significant offset among the invisible items in the balance of payments.

R. J. CAMERON

Canberra.

NOTE

SOME ELEMENTARY THEOREMS IN THE PURE THEORY OF PRICE

In his "Theory of Price"[1] Professor Stigler has stated his five propositions concerning the relationships between average, marginal, and total quantities for both the discrete and continuous cases. The proofs supplied for the discrete case, which is the practically important one, are not particularly satisfactory[2, 3] and are restricted to Propositions 2 and 3 below. For the rest he uses only arithmetic illustration.

A statement of these relationships and examples of their applications may now be found in most prescribed elementary texts on price theory. The purpose of this note is to provide simple algebraic proofs of these relationships which may help to elucidate further the concepts involved for teachers of economics presenting this work to students for the first time. As will be apparent, for this purpose use is made of only the simplest properties of monotonic sequences of a finite number of terms.

The discussion is quite general and applies to other quantities besides product and labour although these two quantities only are used here for simplicity of presentation.

Definitions and Notation

Let

r = the number of units of a variable factor of production, e.g. labour applied to a fixed quantity of the other factors.

t_r = the total number of units of product obtained.

For $r = o$, $t_r = o$

i.e. $t_o = o$ . . . . . (1)

a_r = the average product obtained from the use of the r units of of labour.

Clearly,

$$\left.\begin{array}{ll} a_r = \dfrac{t_r}{r}, & \text{(i)} \\ a_r \text{ is defined only for } r \geqslant 1, & \text{(ii)} \\ \text{and } a_r > o \text{ for all } r \geqslant 1. & \text{(iii)} \end{array}\right\} \quad (2)$$

m_r = the marginal product of the r^{th} unit of the variable factor.

Clearly,

$$m_r = \frac{t_r - t_{r-1}}{r - (r-1)}$$

$$= t_r - t_{r-1} \quad . . . . . \quad (3)$$

and for $r = 1$, $m_r = t_r = a_r$ by (3) and (2(i)).

Using this notation, the five propositions stated by Stigler may now be easily demonstrated.

1. G. J. Stigler, *The Theory of Price,* Revised Edition (Macmillan, N.Y., 1952), pp. 22-24.
2. *Ibid,* p. 297.
3. G. J. Stigler, *The Theory of Price* (Macmillan, N.Y., 1946), p. 44n.

Proposition 1

The sum of the marginal products of the first n units of labour is equal to the total product of these n units.

Algebraically — $\sum_{r=1}^{n} m_r = t_n$ . . . . . (4)

Proof:

Using the definition of marginal product given by (3),

$$\sum_{r=1}^{n} m_r = \sum_{r=1}^{n} (t_r - t_{r-1}) = t_n - t_o.$$

By (1), $t_o = o$

$$\therefore \sum_{r=1}^{n} m_r = t_n \text{ which is (4).}$$

Proposition 2

If, with an increase in the number of labour units employed the average product increases, the marginal product of this unit of labour is greater than the resulting average product.
Algebraically, it is required to prove that—

if $a_r > a_{r-1}$ . . . . . (5)
then $m_r > a_r$ . . . . . (6)

Proof:

By (3)—

$$m_r = t_r - t_{r-1}$$
$$= ra_r - (r-1)a_{r-1} \text{ by (2(i)).}$$

Using (5) and (2(ii) and (iii)), it follows that—

$$m_r > ra_r - (r-1)a_r$$

i.e. $m_r > a_r$ which is (6).

Proposition 3

If, with an increase in the number of labour units employed, the average product decreases, the marginal product of this unit of labour is less than the resulting average product. Algebraically, it is required to prove that—

if $a_r < a_{r-1}$ . . . . . (7)
then $m_r < a_r$ . . . . . (8)

Proof:

As in the proof of the preceding proposition, m_r may be written as—

$$m_r = ra_r - (r-1)a_{r-1}$$

Using (7) and (2(ii) and (iii)) it follows that—

$$m_r < ra_r - (r-1)a_r$$

i.e. $m_r < a_r$ which is (8).

Proposition 4

If, with an increase in the number of labour units employed, the average product is unchanged, the marginal product is equal to the resulting average product.

Algebraically, it is required to prove that—

if $a_r = a_{r-1}$ . . . . . (9)
then $m_r = a_r$ . . . . . (10)

It should be noted that the fact that the average product is unchanged by the addition of a unit of labour is often expressed by saying that the average product is a maximum.

Proof:

As previously—

$$m_r = ra_r - (r-1)a_{r-1}$$
$$= ra_r - (r-1)a_r \text{ by (9)}$$
$$= a_r \text{ which is (10)}$$

Proposition 5

The marginal products of each of the units of labour are unchanged if all the total products are changed by the same fixed amount.

Proof:

Suppose the t_r, $r = 1, 2 \ldots n$ are each changed by a fixed quantity b. Then t_r becomes $t_r \pm b$. Hence, for any r such that $1 \leqslant r \leqslant n$

$$m_r = (t_r \pm b) - (t_{r-1} \pm b)$$
$$= t_r - t_{r-1} \text{ which is (3).}$$

H. D. PRIDMORE

Canberra.

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NEWS AND NOTES

The Committee for Economic Development, 444 Madison Avenue, New York 22, N.Y., announces a competition of ideas on the question, "What is the most important economic problem which the United States must face in the next 20 years?"

Papers should not be more than 2,000 words in length. There will be 50 prizes of five hundred dollars each to the winners.

The closing date is October 31, 1957.

In the note on "An Australian Consumption Function" by H. W. Arndt and B. D. Cameron in the April 1957 issue of the *Economic Record,* an important passage was rendered unintelligible by a typographical error.

Line 7 of page 111 should have read: "changes in NFDI yields a correlation coefficient *of 0·97 compared with a correlation coefficient* of 0·36 for the rela-".

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Industrial Relations in Australia. By KENNETH F. WALKER. (Harvard University Press, 1956). Pp. xviii + 389. 78/9 Aust.

Ever since the publication of H. B. Higgins' *A New Province for Law and Order* (1922) and G. Anderson's *Wage Fixation in Australia* (1929), the study of industrial relations in Australia has been focused almost exclusively on the compulsory arbitration machinery—its structure, its legal characteristics and its principles of wage determination.

Up to a point, the results of these inquiries are interesting and valuable, but they tend to give the misleading impression that industrial relations are synonymous with the arbitration system. Furthermore, prescriptions for industrial peace tend to be based on broad generalizations about compulsory arbitration.

Mark Perlman's *Judges in Industry* (1954) was the first attempt to break away from the traditional approach. His examination of three industries—pastoral, metal trades and stevedoring—shows that arbitration works differently in different settings.

Professor Walker has brought the implicit "ecological" framework of Perlman's study into the open. He has developed it and extended its scope. The central problem of the book is the workings of industrial relations processes in Australia. The basic theme is that the arbitration system is but one of several factors which jointly determine the nature of industrial relations in an industry. Union-management relations must be studied in the context of their total environment—technological, economic and socio-political. "(The study) views industrial relations as the product of the interaction of a system of forces; the strength of the various forces and their functional relationships account for the form of industrial relations at any given time" (p. 13).

This framework of analysis is applied to seven industries—the furniture industry of New South Wales, metal mining in Broken Hill; meat slaughtering in Queensland; coal mining in New South Wales; the pastoral, metal and stevedoring industries. A comprehensive and plausible explanation of the variations in the patterns of industrial relations is presented. Clearly, many more such case studies are needed and it is to be hoped that this book will stimulate such studies.

Will these results provide the basis of a general theory of the determination of industrial relations patterns? Professor Walker seems to think that it will, and he sketches a brief outline of such a theory. The technical, economic and socio-political environmental factors are classified into the following list of "proximate" determinants of industrial relations patterns:

(a) effectiveness of direct action; (b) extent to which union attempts to penetrate managerial functions; (c) stability of organization among employees and employers; (d) nature of the work and circum-

stances of emloyment; (e) economic horizon of employees; (f) methods of management; (g) common social and industrial background and interests of employers and employees; (h) personalities of union leaders, management and employers' association staff; (i) ideological and political objectives.

This list is not necessarily comprehensive and could be made to include other factors, e.g. industrial tribunals.

These determinants are linked together by a process of interaction and thus jointly determine the pattern of industrial relations. The latter may be conceived in terms of the following interdependent characteristics:

(a) frequency and severity of stoppages; (b) the degree to which either side accepts the other and accords the other party's organization a definite role in the conduct of the industry; (c) the extent of co-operation between the parties; (d) the quality of personal relations between the parties and on the job; (e) the role of the industrial tribunal, if any; (f) the extent of change in the above characteristics over time.

In its present form this "general theory" is too broad to be meaningful. For it is conceivable that any particular configuration of industrial relations may be consistent with a large variety of these determinants; and, conversely, a particular set of determinants may be consistent with different patterns of industrial relations.

Obviously, what is missing is a set of constraints which will establish a tighter relationship between the determinants and the industrial relations characteristics. Whether these constraints will ever be available depends largely on advances in the techniques of measurement, which, at the present time, are far from satisfactory. Until then, this "theory" is at best a system of classification, extremely useful as a basis for systematic study, but limited in its predictive value.

Two small queries on the case studies. In discussing the meat slaughtering industry's capacity to pay wages (pp. 155-56), Professor Walker argues that the large investment of fixed capital per worker (wages constitute 11-12 per cent of value of output compared with an average of 20 per cent for Queensland manufacturing) "encourages employers to keep wages as low as possible". Now it could be said of most employers that they try to keep wages as low as possible. But surely the smaller the relative importance of wage costs, the smaller the resistance of employers to wage increases in the face of strike threat?

In the discussion of the pastoral industry, it is difficult to see how the competitive state of the product market has any necessary bearing on the attitude of employers towards wage fixation. Competition here is not of the cutthroat variety, as suggested by Professor Walker, but of an impersonal kind, wool being auctioned under the competitive bidding of buyers. This kind of selling arrangement is much less likely to create disunity between sellers on labour policy than say, the price

and product competition in the furniture trade analysed elsewhere in the book.

This book contains much more than the case studies mentioned above. The inclusion of discussion on the arbitration machinery, trade unionism and employers' association, and the achievement of labour over the years, makes it sufficiently comprehensive as a text for Australian University courses in industrial relations.

It is not rash to predict that this book will stimulate increased research interest in industrial relations in this country. But more than that, it will direct this interest along the right lines.

J. E. ISAAC

University of Melbourne.

The Function and Design of Company Annual Reports. By R. J. CHAMBERS. (Law Book Co. of Australasia, Sydney, 1955.) Pp. xiii + 322. £4/4/- Aust.

In recent years, interest in the form and contents of corporate reports has been intensified by two distinct, but related, views of the purpose of such reports. One of these views is that the purpose of an annual company report is to inform shareholders of the progress of the company, as evidenced mainly by financial data. The other, and wider, view is that the report serves the purpose of informing investors, employees, suppliers, customers and critics of private enterprise concerning the nature of a company's operations, its operating results and the methods by which it has been financed.

Attempts to improve the scope, appearance and clarity of reports for both these purposes are becoming increasingly frequent and increasingly successful, though it cannot yet be claimed that the general level of company reporting in Australia is as high as it should be.

Professor Chambers' book is timely and should be very useful. It is divided into two parts—the first devoted to an enlightened examination of the diverse functions of reports and the second mainly to technical aspects of design and presentation. It is profusely illustrated by selections from examples of good presentation in U.K., U.S.A., Australia and elsewhere; and it contains a comparative analysis of company-law requirements in relation to accounts of U.K., the several Australian States and New Zealand.

One of the dangers of regarding the annual report of a company as a public-relations medium is that attention may be concentrated on display at the expense of the informativeness of the financial statements contained in the report. It cannot be too strongly emphasized that informative financial statements require careful planning and informed technical judgment concerning alternative methods of classifying items in accordance with generally accepted standards of disclosure. Nowadays, the accounting profession, through its professional organizations, is committed to acceptance of the social responsibility of reporting financial results upon a consistent basis from year to year and to

rejection of the time-honoured device of the secret reserve as a means of smoothing out fluctuations in operating results by concealing the fact that fluctuations have occurred. It is questionable whether or not the new accounting doctrine has yet been generally accepted by boards of directors in Australia. Upon the question of desirability of such general acceptance Professor Chambers has firm views. The chapters dealing with the balance sheet, the income statement and supplementary financial and statistical information, which are among the most useful in the book, leave no room for doubt on this score. Indeed, the keynote of the whole book is that it "challenges the view that reticence is a sound business policy, and attempts to marshal the reasons for greater publicity of the facts of business". This is a book which was crying out to be written. The author has made a fine job of it.

A. A. FITZGERALD

University of Melbourne.

The Business Side of Farming. By D. M. MALLOCH and I. W. WESTON. (Whitcombe & Tombs, Christchurch, 1956.) Pp. 88 + 2 page index. 13/6 N.Z.

I. W. Weston, M.Sc., Ph.D., is lecturer in Farm Economics at Lincoln Agricultural College (University of New Zealand) and at once holds a first-class honours degree in Economics and was a practical farmer in two widely separate parts of the North Island before taking up his present South Island position. He previously collaborated with D. M. Malloch, A.P.A.N.Z., in a work on practical farm book-keeping.

The present is a companion volume designed to give the economics of New Zealand farming. Dealing with the wider financial aspects of the farming business rather than the day-to-day book-keeping, it describes not only the business of buying stock and plant, the procedures and problems of marketing, or the planning and costing of the work of a farm in relation to the finance available, but deals with such matters as land use and tenure; the procedures of finding suitable farm land, assessing its value and buying it; the various methods of starting out as a farmer, including means of obtaining the necessary finance; the handling of estates, and the establishment of trusts and profit-sharing systems, so that a farmer may provide for the interests of his sons as future farmers. A final chapter deals with general economic principles. The work is authoritative and can be highly commended to all interested in New Zealand agricultural economics.

E. P. NEALE

Auckland.

Decision Processes. Edited by R. M. THRALL, C. H. COOMBS and R. L. DAVIS. (John Wiley & Sons, New York, Chapman & Hall, London, 1954.) Pp. vii + 332. $5.00.

In their *Theory of Games and Economic Behaviour* von Neumann and Morgenstern applied a set of new and ingenious tools developed by the first-named author to a number of problems of long standing in

economic theory. The result has been the emergence of what might perhaps be looked upon as a new discipline, of interest not only to economists but also to students of military and political affairs, of learning theory and social psychology, of philosophers, statisticians and general mathematicians—a discipline tentatively called the general study of decision processes. Its devotees study the universal aspects of the processes by which people, individually or collectively, reach decisions, presumably in their own interests or in the interest of some corporate entity. Most studies in this field have been of a formal, abstract nature, though based on the more loosely structured work done by economists, learning theorists and others in earlier years; but some experimental work has been done in the new framework on radically simplified situations, particularly with a view to testing various hypotheses regarding action under uncertainty, which is at the centre of the present general study of decision processes.

The volume under review contains mostly elaborated versions of papers given at a seminar on this topic held in 1952. After a helpful survey of the volume by R. L. Davis and an expository note on mathematical models and measurement theory, the volume presents five papers on "individual and social choice", three on "learning theory", five on "theory and applications of utility" and four "experimental studies".

The reviewer found John Milnor's paper on games against nature (which, as shown by Wald, form a model for statistical decisions) most interesting. Consider a rectangular array of number with the number u_{ij} in the i^{th} row and j^{th} column representing the amount lost (or rather its "utility") by a player who chooses the i^{th} row when his opponent chooses the j^{th} column (neither knowing the other's choice until each has made his). The problem is to formulate for the first player a reasonable way of choosing a row. Game theory shows that if what the first player loses is what his opponent gains and if the opponent's utility scale for gains is the same or an increasing function of the first player's utility scale for losses and if it may be assumed that the opponent attempts to maximize his utility and assumes his opponent to do so, the first player can minimize the utility of his loss by choosing such a row that his maximum loss is as small as possible (minimax rule). If the opponent is nature, the above assumptions may not be reasonable. Various other rules have been considered and their properties are considered thoroughly in Milnor's paper. None of these rules have all the properties that may be considered desirable (the author says, but does not demonstrate, that no possible rules can have all those properties), but the author constructs a rather complicated rule which has what he feels are the most fundamental and important of these properties. The paper following this also adds to our knowledge of the properties of proposed decision rules.

Coombs applies his unfolding technique to social choice. Vail mentions experiments which reportedly show that if choice is between evils, the lesser loss is chosen regardless of the relative odds of the two

evils, but that if choice is between two positive prizes, the surer prize is chosen regardless of the two prizes. One may well wonder about the universe of validity of these results. Two papers concern themselves with apparent deviations from "reasonable behaviour" and show the danger of depending entirely on "common-sense notions concerning characteristics of individual behaviour". Two papers explore the algebraic structure of a multidimensional utility theory. Marshak explores the rudiments of an economic theory of organization and information.

What is perhaps most surprising is that none of the participants comments on the general theory of behaviour, utility and probability proposed by Barankin in a set of reports available to the participants (a printed account of its outlines has meanwhile become available in *Econometrica* vol. 21, pp. 474-5 and the *Proceedings of the Third Berkeley Symposium on Mathematical Statistics and Probability*, vol. 5, pp. 21-52). This work is the first attempt to define these concepts simultaneously and consistently, and can therefore not be overlooked by workers in this field. It is also disappointing that only slight attention was paid to statistical decision theory.

H. S. Konijn

University of Sydney.

The Role of the Economist as Official Adviser. By W. A. Jöhr and H. W. Singer. (George Allen & Unwin, London, 1955.) Pp. xii + 150. 15/- stg.

This is a balanced, short, informative and provocative investigation of economic advising. The authors are sure of their objective: "The main task of economics consists in preparing the decisions which have to be taken by economic policy." They are unpretentious about methodology: "Many authors instinctively set about tackling these problems in the right way. But after studying the methodology they became conscious of the numerous pitfalls and other dangers which are waiting for them. The result is that they lose their former sure touch, and are led astray or in unsuitable directions. Scholars of this type are warned off methodology and advised especially not to read the following treatise."

The book is mainly the work of Professor Jöhr, with some pertinent and (to the reviewer, a one-time international civil servant) slightly bitter interpolations by Dr. Singer on the special problems arising in the economic research divisions of international organizations. (I liked, particularly, his description of the delicate task of such groups: "to lead the horse to the water, but not to make it drink".)

A foreword by Professor E. A. G. Robinson supplies both an admirable summary and a useful restoration of balance on a couple of points where the authors appear to go too far. Special praise is due to the translators, Jane Degras and Stephen Frowein, for the excellent English version—though I boggle a little at the "three-volume study

. . . entitled *Ortsbestimmung der Gegenwart*, thus reflecting its basic objective" and "there may be a tendency to assume that *'nicht sein kann, was nicht sein darf'* ".

On delimiting the problem to be investigated, Professor Jöhr emphasizes the need for economic research to give an opinion on present-day problems within a useful time and to avoid carrying theoretical refinement further than is useful for judging the concrete problem. Dr. Singer's comment, that an international staff of economists representing different political and economic systems may find it easier to agree on concrete proposals than on ultimate causes, is surely equally true at the national level.

Economic policy requires the establishment of an aim, an appraisal of the present situation, and a judgment of the effect of economic policy measures in transforming the existing situation into one more consistent with the aim. Professor Jöhr is perhaps too rigid in insisting, in a part entitled "The Role of the Economist in Official Employment", that the economist should not sacrifice his own convictions to those of his principal. There is a useful and proper division of labour here. The academic economist should work with reference to his own aims—provided he states these clearly. But the non-academic employer—be it a government, an opposition, a trade union or an employers' organization—is surely entitled to buy economic advice as to how *his* aims can be carried out, however much that advice may be accompanied by argument that other aims would be preferable.

The discussion of the judgment of economic measures is excellent, particularly in its emphasis on the importance of weighing secondary effects as well as main effects and on the need to consider alternative and supplementary measures. The plausible general statement that a milder application of several measures is better than a drastic application of a single measure is immediately tempered by pointing out that it might be better, where for instance the aim is to restore a balance between domestic and foreign costs, to rely wholly on devaluation than to seek to moderate that policy's disadvantages by carrying some of the adjustment by reducing domestic wages and costs.

A chapter on the difficulties of forecasting concludes with the useful recommendation to be short on forecasting, but long on assuming. The comments on the obligation of the economist to advise are admirably balanced. Statesmen and public authorities must take decisions and the economist neither can nor should release them from that burden. But the economist has not merely the right but also the duty to weigh his arguments, to reach his own conclusion and to submit them to the authority. The policy-maker's job is "to decide whether or not to accept the advice of the expert, whether or not to adopt his opinion. And even if he rejects it, the reasoned judgment of the scientist is in most cases useful to him, because it makes it easier for him to attach other weights to some of the factors, and then in an analogous or similar fashion to deduce the answer that is decisive for him".

The discussion of the types of opposition to economic measures, the extent to which economists should allow for these and the obligation on him to engage in propagandist and educational activities to persuade people to support sound economic policies should be compulsory reading for both newspaper leader-writers and like-minded people in the academies. Even the misleading slogan has its place.

This part concludes with a discussion of the qualities needed by the economist dealing with problems of policy, citing in particular the advantages of being, like Keynes, a passionate and habitual conversationalist. An appendix discusses Tinbergen's *On the Theory of Economic Policy*.

Part two is an essay on *The Problem of the Economic Order*, in the light of the need, on the one hand, to co-ordinate the various activities of individual economic agents and, on the other, to subordinate economic goals to other goals. The major objectives set down by Professor Jöhr may have been described by an Austrian colleague as a "bundle of fine Swiss ideals", but that makes them neither less interesting nor less worthy. An examination of the market economy, of socialism and of a system based on agreement between different organized interests leads to the conclusion that the best solution to the problem of economic order is a market economy guided by the state and supplemented by collective agreements.

R. I. DOWNING

University of Melbourne.

OTHER BOOKS

Administering a Conversion to Electronic Accounting. By HAROLD F. CRAIG. (Division of Research, Harvard Business School, Boston, 1955.) Pp. 224. $2.50.

This book is a case study of procedural and personal problems arising in a large insurance company in the conversion of its accounting procedures to electronic accounting. It describes the organization of a selected department of the company before and after the introduction of new procedures, and presents some aspects of the behaviour of administrative officers and clerical employees during the conversion. —L.G.

Agriculture and Industry: Relative Income. By J. R. BELLERBY. (Macmillan, London, 1956.) Pp. xii + 370. 49/9 Aust.

This book presents the results of a statistical investigation of the degree of disparity between farm and non-farm incomes. Five countries are studied in detail, and data from many others are used for purposes of comparison. Disparity is measured by the "income incentive ratio", and an attempt is made to rank the causes of the persistent low ratio associated with relatively low farm incomes. The ratio tended to rise during and immediately after the war, and the book concludes with a discussion of the measures required to prevent a renewed decline in the future.—G.C.McL.

Some Problems of Incentives and Labour Productivity in Soviet Industry. By G. R. BARKER. (Basil Blackwell, Oxford, Macmillan, London.) Pp. 131. 23/3 Aust.

This small book starts with a discussion of measurement of productivity, deals briefly with changes in productivity in the U.S.S.R., but is mainly concentrated on incentives. It describes the strong Soviet egalitarian tendencies in the early days with a reliance on coercion, personal convictions and propaganda as the main stimuli to work. Then it deals with the fundamental revision of the attitude to equality of incomes ordered by Stalin in 1931. It describes the present Soviet incentive system under the headings of "contributive", "acquisitive", and "compulsion" incentives.—K.B.

The Structural Interdependence of the Economy. Edited by T. BARNA. (Wiley, New York, 1956.) Pp. 429. $7.50.

Studies in Inter-Sectoral Relations. By P. NORREGAARD RASMUSSEN. (North-Holland, Amsterdam, 1956.) Pp. 217. $6.00.

The volume edited by Barna contains twenty of the papers read at the Varenna conference on input-output analysis in 1954. Part I has separate papers on input-output analysis (including Duane Evans' valuable review of computation methods), linear programming and process analysis. Markowitz' ideas on the use of an economy-wide process analysis model for feasibility testing (as in industrial mobilization) are the most stimulating in the book—although a vast amount of numerical data would first have to be collected. The desirability of data on a process basis has of course never been contested by analysts who use industry flow statistics *faute de mieux.*

Since the papers in the later Parts cover almost every aspect of input-output analysis this is a useful reference volume for those wishing to keep in touch with the diverse lines upon which research is currently proceeding. Such lines include interregional analysis, demand analysis, social accounting, the aggregation problem—as well as reports on input-output work in six European countries.

Norregaard Rasmussen's book is primarily for specialists. It is a pilot study of the application, deficiencies and methodology of input-output analysis. The argument is illustrated from Danish tables (in which unfortunately service industries comprise eleven of the twenty-one sectors). The main original contribution is in the study of inter-industry terms of trade.—B.C.

Money, Interest and Prices. By DON PATINKIN. (Row Peterson, Illinois, 1956.) Pp. xix + 497. $7.00.

The first part of this book is a lengthy literary restatement of need to include assets as well as income into the budget restraint for the consumer; as the author had shown in his valuable *Econometrica* articles, this lacuna in the theory of value could not but leave the absolute price level indeterminate on classical assumptions of rational choice. The second part is also a lengthier restatement of his rehabilita-

tion and clarification of the quantity theory of money; it adds little to the shorter article he wrote for Kurihara's *Post Keynesian Economics*. The third part is a prolix mathematical appendix, the essential argument of which was put far more briefly in Klein's mathematical appendix to *The Keynesian Revolution*. The last part is an interesting series of notes on monetary theory of various famous writers from Walras to Keynes. The book is well reasoned, but surprisingly neglects empirical tests of hypotheses derived from the theory of rational behaviour as well as suggestions for other hypotheses to explain aggregate demand and the absolute price level.—C.G.F.S.

Hobson and Consumption. By E. E. NEMMERS. (North Holland Publishing Company, Amsterdam, 1956.) Pp. 152. 31/- stg.

The author is from the University of Wisconsin, and one has the impression that this is probably a promotion piece. It is hastily written and poorly expressed (although I was probably prejudiced after reading about "gluttability" in the introduction); the treatment of the problem is competent, although in no sense inspired. I felt that the author was wrong in his view that little attention has been given to Hobson's work: it is now conventional for treatises on imperialism to begin with a discussion of his analysis, and, of course, Lenin's contribution is extensively based on Hobson's thesis, which is integrated with Lenin's doctrines on finance capital. Because he either inadequately appreciates, or prefers to ignore, the extent to which Hobson has influenced others (which is the essence of his importance) Professor Nemmers deprives his study of much of its potential interest and relevance.—K.H.

On the History and Method of Economics. By FRANK H. KNIGHT. (University of Chicago Press, 1956.) Pp. vii + 309. $6.00.

This book brings together and reprints twelve of Professor Knight's essays and review articles on the history, method and significance of economic science, originally published at various dates between 1928 and 1951. It will serve as a useful and very convenient reference work for all those concerned in the teaching of economic methodology or the history of economic theory. Professor Knight's views are as stimulating as they are authoritative.—G.S.L.T.

On Freedom and Free Enterprise. Edited by MARY SENNHOLZ. (D. van Nostrand, Princeton, 1956.) Pp. 333. $4.00.

This is a selection of twenty essays in honour of Ludwig von Mises. Accordingly, nearly all of them are directed against what the authors consider to be the political and economic consequences of "Statism". Probably the only essays of significance are a reconsideration by F. A. Hayek of progressive taxation and a penetrating and topical analysis of French Socialism by Louis Baudin. Unfortunately, the latter essay is spoiled by very bad translation.—K.H.

BOOKS RECEIVED*

A.—AUSTRALIAN AND NEW ZEALAND PUBLICATIONS

CROWLEY, F. K. (ed.). *University Studies in History and Economics.* (Vol. II, No. 4). Sponsored by the Publications Committee of the University of Western Australia. (S. H. Lamb, Fremantle, 1956.) Pp. 118. 3/6 Aust.

DAVIDSON, F. G. *The Industrialization of Australia.* (Melbourne University Press, Carlton, Victoria, 1957.) Pp. 26. 3/6 Aust.

After three pages of historical background, the middle sixteen pages of this booklet are devoted to the structure, and to some extent the prospects, of particular manufacturing industries—non-ferrous metals, iron and steel, motor vehicles, electrical equipment, paper, etc. There are three tables: one shows employment and production in various industries in 1950-1 and 1954-5, the official subclasses being regrouped and rearranged; another similarly re-presents official data on size of factory in 1953-4; and another reproduces the Australia and New Zealand Bank annual index of factory production. The last seven pages discuss the arguments for and against industrialization.

DOWNING, R. I. *National Income and Social Accounts—An Australian Study.* (3rd ed.). (Melbourne University Press, Carlton, Victoria, 1957.) Pp. 62. 6/- Aust.

Since its first appearance in 1951, this study of the nature and uses of social accounts has been widely used by Australian students as a means of relating textbook discussions of underlying principles to the complex statistical presentations of Commonwealth Government White Papers. The third edition, like its predecessors, begins with a simple discussion of income flows and the process of income determination as a basis for developing the sector accounts and the main aggregates. The section on structure has been re-written in terms of the 1955-6 estimates and now presents a simpler framework of the essential transactions in both account and matrix form; the complete version appears in the Appendix. The final chapter on the use of the estimates has also been completely revised in terms of current problems of economic policy.

KARMEL, P. H. *Applied Statistics for Economists.* (Pitman, Melbourne, 1957.) Pp. 452. 72/6 Aust.

PIKE, DOUGLAS. *Paradise of Dissent—South Australia 1829-57.* (Longmans, Green, Melbourne, 1957.) Pp. 572. 70/-. Aust.

THOMPSON, PATRICIA. *Our Northern Treasure House. (A Background of Australia Book.)* (Shakespeare Head Press, Sydney, 1956.) Pp. 127. 7/6 Aust.

WINSTON, DENIS. *Sydney's Great Experiment.* (Angus & Robertson, Sydney, 1957.) Pp. 146. 37/6 Aust.

WOODRUFF, W., and MCGREGOR, L. *The Suez Canal and the Australian Economy.* (Melbourne University Press, Carlton, Victoria, 1957). Pp. 20. 2/6 Aust.

With the blocking of the Suez Canal in November 1956, one of Australia's lifelines with the rest of the world was severed. In this pamphlet the authors have tried to provide the historical perspective without which no satisfactory inquiry of this event can be made. They have traced the use of the Canal and its impact on the course of Australian development since its opening in 1869. For the first time an attempt has been made to explain the changing currents of Australian merchandise passing through the Canal. In undertaking these tasks the authors have made an important contribution to a topic that must be of vital importance to Australia and all those who trade with her.

B.—OTHER PUBLICATIONS

ABRAMSON, A. G., and MACK, R. H. (eds.). *Business Forecasting in Practice.* (John Wiley & Sons, New York, 1956.) Pp. 275. $6.50.

This book comprises eight essays by practising forecasters. The two introductory chapters contain an outline of business cycle theories and a discussion of the main techniques used in forecasting. The remaining chapters are essentially detailed post-mortems of business forecasts which have been made in the United States since 1949.

* Acknowledgment of publications does not guarantee review.

The desire by business to be prepared for business fluctuations is a natural outcome of the growth of large-scale enterprise and improved technical efficiency. As forecasts for individual industries generally require prior consideration to be given to an examination of the overall economic prospects, this book and that by Maisel listed below should be useful for students of market research.

ALLEN, G. C., and DONNITHORNE, A. G. *Western Enterprise in Indonesia and Malaya.* (George Allen & Unwin, London, 1957.) Pp. 321. 25/- stg.

This study of the investment of Western capital and the application of Western technologies in part of South-East Asia will be warmly received by those whose interests lie in this part of the world. The authors have assembled a vast amount of material on agricultural development, mining, manufacturing and commerce; transport, apart from a chapter on shipping, is somewhat curiously overlooked. The authors disclaim any intention of writing an economic history, but their approach is essentially historical and descriptive. The intricate inter-racial economic relationships between Asians and Europeans do not receive the close attention that the authors proclaim; it is hardly possible to get a correct picture of the magnitude and ramifications of the Chinese contribution to economic development in the two countries from this study. The treatment of events since 1950 does not receive adequate attention, and the failure to use Indonesian sources must be considered a serious omission.

ALLEN, R. G. D. *Mathematical Economics.* (Macmillan, London, 1956.) Pp. 768. 90/9 Aust.

AUBREY, HENRY G. *United States Imports and World Trade.* (Oxford University Press, London, 1957.) Pp. 169. 39/3 Aust.

BAADE, FRITZ. *Die Lage der Weltwirtschaft und ihre Bedeutung für die Landwirtschaft.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1957.) Pp. 26. Price not stated.

BEHRMAN, JACK, N., and SCHMIDT, WILSON E. *International Economics.* (Rinehart, New York, 1957.) Pp. 561. $6.50.

This book provides a wider coverage of topics than those usually included in an elementary text. Furthermore, it does so in an interesting and readable manner. There is a section on the development of theory and policy during the nineteenth century, which, although inadequate for advanced students, provides a useful introduction to the history of economic thought in these fields. Of more importance, however, is the large section devoted to United States' foreign policies since World War II. This section covers foreign aid programmes, technical assistance, foreign investment, and commercial policies such as tariffs, agricultural support programmes and stockpiling of strategic materials.

BENHAM, FREDERIC. *The Colombo Plan and Other Essays.* (The Royal Institute of International Affairs, London, 1956.) Pp. 89. 7/6 stg.

In this volume of five short essays, Professor Benham discusses some of the major economic problems of under-developed countries, especially in the Far East. In dealing with such questions as over-population, protection, deficit finance and price stabilization, the author addresses himself primarily to the non-specialist.

BERNARD, KARL. *Gedanken zur Kreditpolitik.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1957.) Pp. 16. DM 1.50.

BERRY, CHARLES H., and others. *The Demand for Fluid Skimmed Milk.* (Bulletin 325.) (Storrs Agricultural Experiment Station, Storrs, Connecticut, 1956.) Pp. 31. Price not stated.

BOBER, M. M. *Intermediate Price & Income Theory.* (Bowes & Bowes, London, 1956.) Pp. 526. Price not stated.

CHATAWAY, H. D. *Economics and Life.* (Ryerson Press, Toronto, 1948.) Pp. 222. $3.50.

CRUMP, NORMAN. *The A B C of the Foreign Exchanges.* (Twelfth Edition.) (Macmillan, London, 1956.) Pp. 374. 16/- stg.

DANDEKAR, V. M., and KHUDANPUR, G. J. *Working of Bombay Tenancy Act, 1948. Report of Investigation.* (Gokhale Institute of Politics and Economics, Poona, 1957.) Pp. 194. Rs. 7/50.

DE PODWIN, HORACE J. *Discharging Business Tax Liabilities.* (Rutgers University Press, New Brunswick, N.J., 1956.) Pp. 167. $4.00.

DEVONS, E. *An Introduction to British Economic Statistics.* (Cambridge University Press, London, 1956.) Pp. 255. 22/6 stg.

Whereas there is a surfeit of standard texts on elementary statistical theory for economists, Professor Devons feels that it is difficult for the general student to find a simple introduction to the realm of published economic statistics. There is no easy way, he points out, to learn to use such figures correctly. His book attempts both to point out the pitfalls, and to act as a guide through the maze of official British publications in the field. Chapters on special topics such as population and national income point out the difficulties inherent in measuring such magnitudes, and give a list of sources of the relevant statistics.

FETTER, FRANK W. (ed.). *The Economic Writings of Francis Horner in the Edinburgh Review 1802-6.* (The London School of Economics and Political Science, London, 1957.) Pp. 134. 21/- stg.

FROWEN, STEPHEN, and HILLMAN, H. C. (eds.). *Economic Issues.* (Waterlow & Sons, London, 1957.) Pp. 231. 21/6 stg.

Here is a collection of topical articles, many by eminent authors, which appeared originally in *The Bankers' Magazine* through the years 1954-7. Among the contributors are Harrod, Hawtrey, Klein, Shackle and Colin Clark; and the matters with which they and others deal range through inflation, measurement of national income, fiscal policy, monetary controversy, development, and finally international economics.

In a quaint Foreword, after having appraised bankers in terms which should warm the cockles of their hearts, Professor Shackle himself describes the volume as "fascinating, profound . . . full of ideas hot from the forge of events, and glowing with the intellectual vitality of a band of contributors dedicated to their subject". Shackle is an entertaining fellow—perhaps the Edgeworth of our time.

GIGNOUX, C. J. *Histoire d'une Enterprise Frannçaise.* (Hachette, Paris, 1955.) Pp. 254. Price not stated.

GRABBE, E. M. (ed.). *Automation in Business & Industry.* (John Wiley & Sons, New York, 1957.) Pp. 611. $10.00.

HAMMOND, R. J. *Food.* (Volume II.) (History of the Second World War: Studies in Administration and Control.) (H.M. Stationery Office and Longmans, Green, London, 1956.) Pp. 835. 50/- stg.

HEECKT, HUGO. *Der Verkehr als Integrationsfaktor der Europawirtschaft.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1956.) Pp. 106. DM 10.

HOBSON, J. A., and MUMMERY, A. F. *The Physiology of Industry.* (Kelley & Millman, New York, 1956.) Pp. 215. $5.00.

INSTITUT FÜR WELTWIRTSCHAFT AN DER UNIVERSITÄT KIEL. *Die Weltwirtschaft,* 1956, Heft 2. (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1956.) Pp. 61. DM 10.

International Banking and Foreign Trade. (A series of Lectures delivered at the Ninth International Banking Summer School, Rutgers University, New Jersey, U.S.A., July 1956.) (Europa Publications, London, for The Graduate School of Banking and The Institute of Bankers, 1956.) Pp. 261. 30/- stg.

This series of lectures is concerned with American subject-matter, but its approach is such as to make the matters covered of interest to non-American readers. About a third of the book is devoted to a very useful survey of recent United States monetary policy. The greater part of the remainder covers financial subjects of international interest, such as the financing of United States foreign trade (in the balance of payments sense of how the world's dollar requirements have been met, and also in the sense of what institutions are available to finance American exports), United States foreign economic policy (by a senior official of the State Department) and (perhaps of greatest interest to Australian readers) a lecture entitled "Private U.S. Direct Investment Abroad" by the Treasurer of the Standard Oil Company (N.J.).

INTERNATIONAL LABOUR OFFICE. *Social Aspects of European Co-operation.* (I.L.O., Geneva, 1956.) Pp. 179. 9/- stg.

INTERNATIONAL STATISTICAL INSTITUTE. *Bibliography on Index Numbers.* (International Institute, The Hague, 1956.) Pp. 40. 4/8 stg.

ISOU, ISIDORE. *Traité d'Economie Nucléaire. Le Soulèvement de la Jeunesse.* (Librairie de la Porte Latine, and Editions Maurice Lemaitre, Paris, undated.) Pp. 342. 900 frs.

KOIVISTO, WILLIAM A. *Principles and Problems of Modern Economics.* (John Wiley & Sons, New York, 1957.) Pp. 834. $6.00.

KOJIRO NISHIKAWA. *Origin of Cash Method of Bookkeeping in Japan.* (Science Council of Japan, Tokyo, 1956.) Pp. 23. Price not stated.

KURIHARA, KENNETH K. *Introduction to Keynesian Dynamics.* (Allen & Unwin, London, 1956.) Pp. 222. 21/- stg.

LEUBUSCHER, CHARLOTTE. *Bulk-Buying From the Colonies.* (Oxford University Press, London, 1956.) Pp. 206. 54/6 Aust.

This is a study of the bulk purchase of Colonial commodities by the United Kingdom Government, from its inception early in the Second World War either until the agreements were terminated or to the end of 1954. The history of the various agreements, analysed by commodities, is first given followed by an examination of the terms of the various agreements. There is an interesting and helpful analysis of the consequences of bulk-purchase, not only for the United Kingdom and the Colonies, but also upon international trade generally and for the countries that were not party to them. The analysis is not confined to the bulk purchase of Colonial products, as consideration is also given to that of dairy produce from Australia, New Zealand and Denmark, whilst the discussion of the Commonwealth Sugar Agreement of course extends also to the independent Commonwealth countries that have been parties to it as producers or consumers.

LITTLETON, A. C., and YAMEY, B. S. *Studies in the History of Accounting.* (Sweet & Maxwell, London, 1956.) Pp. 392. 50/- stg.

This volume, published under the joint auspices of an English body, The Association of University Teachers of Accounting, and of The American Accounting Association, should prove of interest not only to accountants but to all those interested in the history of trade and commerce.

Many of the contributors are primarily economic historians, not accountants, and the articles—the majority of which were written especially for the Studies—cover the period from accounting by the early Greeks and Romans to the introduction of double-entry book-keeping in Japan in the late nineteenth century. Australia is represented by Louis Goldberg's "Some Early Australian Accounting Records", based on documents and records held in the Mitchell Library.

MACNIECE, E. H. *Production Forecasting, Planning, and Control* (2nd Ed.). (John Wiley & Sons, New York, 1957.) Pp. 374. $8.25.

MAISEL, SHERMAN J. *Fluctuations, Growth, and Forecasting.* (John Wiley & Sons, New York, 1957.) Pp. 552. $7.50.

While trying to retain most of the analysis contained in conventional macro-economic textbooks, Professor Maisel has set out to present the information in a manner which is likely to be of use to the student of economics going into business. As far as possible the theory behind the analysis is presented with an illustration showing how it may have application in business. In the field of macro-economics, case studies are neither easy to obtain nor easy to apply. This book makes the most of the material available. One of the case studies is an outline of how to project the Gross National Product of the United States.

MEYER, F. V. *United Kingdom Trade with Europe.* (Bowes & Bowes, London, 1957.) Pp. 197. 21/- stg.

This book presents the results of a statistical investigation carried out by the author in 1953-4 as a Council of Europe Research Fellow. It shows how the level and pattern of British trade with the Continent has changed, particularly over the past twenty years, and it discusses the implications of these changes against the wider setting of world trade.

MYRDAL, GUNNAR. *An International Economy.* (Routledge & Kegan Paul, London, 1956.) Pp. 381. 37/6 stg.

NEMMERS, E. E. *Hobson and Consumption.* (North Holland Publishing Co., Amsterdam, 1956.) Pp. 152. 31/- stg.

RAU, ALLAN. *Agricultural Policy and Trade Liberalization in the United States 1934-1956.* (E. Droz, Geneva, 1957.) Pp. 160. Price not stated.

ROBSON, R. *The Cotton Industry in Britain.* (Macmillan, London, 1957.) Pp. 364. 86/3 Aust.

ROOSA, ROBERT V. *Federal Reserve Operations in the Money and Government Securities Markets.* (Federal Reserve Bank of New York, New York, 1956.) Pp. 108. Price not stated.

SAYERS, R. S. *Financial Policy, 1939-1945.* (*History of the Second World War.*) (H. M. Stationery Office, and Longmans, London, 1956.) Pp. 608. 37/6 stg.

This volume is a detailed study of the financial problems and policies of the British Government during the Second World War. Beginning with a short theoretical review of the importance of sound finance in mobilization and pursuit of war, Professor Sayers devotes the first part of his work (Chs. II-VII) to an analysis of internal monetary and budgetary policies. The more intricate difficulties of external finance form the subject matter of the somewhat longer second part (Chs. VIII-XV). The material of the book, consisting largely of official Treasury papers, is integrated and analysed with brilliant lucidity. "Financial Policy, 1939-1945" should be read by all students interested in the financial administration of a modern war economy.

SHOZABURO SAKAI. *The Theory of Structural Change of National Economy.* (The Science Council of Japan, Tokyo, 1956.) Pp. 120. Price not stated.

SMITH, H. P. *Labour and Learning.* (Basil Blackwell, Oxford, 1956.) Pp. 92. 12/6 Aust.

STANDARD OIL COMPANY OF CALIFORNIA. *The Management Guide.* (Second Edition). Standard Oil Co. of California, 1956.) Pp. 76. Price not stated.

The Journal of Business Law. (Stevens & Sons, London, Law Book Co. of Australasia, Melbourne.) Quarterly, 7/6 stg.; annual subscription in Australia 45/- Aust. post free.

The first issue of this new journal, that for January 1957, contains 120 pp., and includes articles on restrictive trading agreements and minority shareholder protection in American Corporation law. The editor is Dr. Clive M. Schmitthoff. The *Journal* is particularly directed at everyone who is responsible for the management and running of a business.

TINBERGEN, J. *Economic Policy.* (North-Holland Publishing Co., Amsterdam, 1956.) Pp. 276. 53/- stg.

UNITED NATIONS. *Economic Developments in Africa 1954-55.* (United Nations, New York, 1956.) Pp. 100. 11/- stg.

UNITED NATIONS. *Economic Developments in the Middle East 1954-55.* (United Nations, New York, 1956.) Pp. 151. 7/- stg.

UNITED NATIONS. *Peaceful Uses of Atomic Energy.* Volume 1: *The World's Requirements for Energy: The Role of Nuclear Power.* Volume 13: *Legal, Administrative, Health and Safety Aspects of Large Scale Use of Nuclear Energy.* (United Nations, New York, 1956.) Volume 1: Pp. 479. 57/- stg. Volume 13: Pp. 393. 50/- stg.

UNITED NATIONS. *World Economic Survey 1955.* (United Nations, New York, 1956.) Pp. 201. 14/- stg.

WEILER, E. T., and MARTIN, W. H. *The American Economic System.* (Macmillan, New York, 1957.) Pp. 623. Price not stated.

WEISE, DR. HERBERT. *Die Steuern im Vereinigten Königreich.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1957.) Pp. 360 + separate tables. DM 40.

WHITTAKER, EDMUND. *Economic Analysis.* (John Wiley & Sons, New York, 1956.) Pp. 460. $.50.

WILEY, JOHN & SONS, INC. *The First One Hundred and Fifty Years.* (John Wiley & Sons, New York, 1957.) Pp. 242. $7.50.

YASUMA TAKATA. *An Introduction to Sociological Economics.* (The Science Council of Japan, Tokyo, 1956.) Pp. 83. Price not stated.

ZINNER, PAUL E. (ed.). *National Communism and Popular Revolt in Eastern Europe.* (Columbia University Press, 1956-7.) Being distributed with the aid of a grant from the Ford Foundation. Pp. 563.

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